Topic A
Internet
இந்துஞ்சற
The Tamil Wikipedia: Criteria for Evaluation and Enrichment

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‘Wikipedia’, according to the founder Jimmy Donal Wales, an American financial-trader-turned internet-entrepreneur ‘is a freely licensed encyclopedia written by thousands of volunteers on the Internet in over a hundred languages and it’s one of the fastest growing Web sites’. Wikipedia had a predecessor in Nupedia, launched in March 2000 as the free encyclopedia, a peer-reviewed open-content encyclopedia, that lasted for only three years before it became defunct in September 2003. The Hawaiian word ‘wiki’ means ‘quick’ and the Wikipedia, founded in a collaboratively edited, multilingual free encyclopedia supported by the non-profit Wikimedia Foundation, established in Florida, USA and Headquartered in Sanfrancisco, California, USA, with more than 23 million articles in 285 languages, launched in 2001 has grown so rapidly that the English Wiki alone has more than 4.1million articles and most of the wikis such as Malayalam wiki, Urdu wiki, Arabic wiki etc have more than 1000 articles in each of them. The Wikipedia in its various versions has become the largest and the most popular general reference work on the Internet, having as many as 365 million readers approximately.

The Tamil Wikipedia

The Tamil Wikipedia is a free online encyclopedia like its counterparts such as English, Telugu, Hindi, Gujarati, Kannada, Malayalam etc encyclopedias run by the Wikimedia foundation. The Tamil Wikipedia established in September 2003 has more than 48000 articles by the second week of October 2012. This is the 59th Wikipedia of the world by article count. English wiki with its 4077000 articles is the largest Wikipedia of the world. Among the Indian languages Tamil ranks third, having Hindi and Telugu above it by article count.

Poor Turnout of Articles from Tamil Nadu

Even though the Govt. of Tamil Nadu in the year 2010 conducted a contest, being the first of its kind, for promoting among college students the habit of contributing to the Tamil Wikipedia, the number of articles produced by students and others remaining nothing but meager. In spite of the fact that the general awareness of and the interest in Tamil Studies is on the rise, the number of Wikipedia articles produced ever since the inception of the Tamil edition of the Wikipedia is deplorably low. The contribution of scholars from Tamil Nadu where Tamil is predominantly spoken and used widely in all walks of life is far from satisfactory. The scholars and professionals from Tamil Nadu rarely come forward to make entries to the Tamil Wikipedia while most of the development of Tamil wiki comes from Tamil Diaspora spread over a number of countries such as Malaysia, Singapore, south Africa, France, Germany, Australia, UAE, Switzerland, Canada, the USA, Fiji etc. The percentage of entries received from the former is only 7% while those received from Tamil Diaspora is 93%.

Reasons for the Meager Participation by Mainland Tamils

It has been seen that there is a poor turnout of articles that suffer not only quantitatively but also qualitatively. Besides the participation of the Tamil community in Tamil Nadu in this world class Tamil Wiki project is meager to say the least. The number of contributors from Tamil Nadu where Tamil is predominantly spoken, where Tamil is the official language of the state, where Tamil is used as a language of administration, education, culture etc. in a world class project of this kind is nothing but minimal. Even among those who contribute only a handful among them are either active or very active contributors while the vast majority among the contributors being desultory.

There is a disconnect or mismatch between computing skills needed for potential contributors and the subject knowledge or specialization required for giving a comprehensive account in an encyclopedia. Those who have subject knowledge or specialization may lack in computing skills such as technical ability required for serving either as a contributor or as a collaborative editor. There are many who have technical skills but they lack in knowledge relating to the field chosen for making a presentation in the form of an encyclopedic entry. With scanty or inadequate knowledge in the area chosen for an entry, the articles produced by them tend to become a stub lacking in details and citations. Rarely do we come across a situation in the Tamil mainland i.e., Tamil Nadu where these two skills go together.
Single-authorship and Multiple-authorship

Some of the contributors may be happy as a single-author contributor. They may be uncomfortable with collaborative editing or writing since While involved in collaborative writing or editing, one is expected to ensure the use of stylistic equivalences at various levels of language use. To preserve uniformity in style is a stupendous task with which some of the potential contributors may not be familiar with. This may be a possible reason for many not coming forward to make contributions to the Tamil Wikipedia.

Physical Facilities

One can identify other reasons connected with physical facilities such as non-availability of computer with internet connectivity in urban or semi-urban or rural areas on occasions in which they would like to spend time engaging themselves either in collaborative editing or in writing to the Tamil Wiki. This sort of situation prevails more often in remote or rural areas of Tamil Nadu than in its urban or semi-urban areas. This is particularly true in the case of Tamil Nadu which was in the forefront in getting classical language status to Tamil fighting for this privilege over a period of one hundred years and more.

Two Specimen Entries

Following are two versions of specimen entries relating to the classical Tamil work ங஧ன்ஜ஗நடிம஑ (The salver of Four Gems as translated by G.U. Pope). A careful evaluation of these two entries will focus on problems connected with making a satisfactory entry suitable for the Tamil Wikipedia.

Specimen 1

Following are two versions of specimen entries relating to the classical Tamil work ங஧ன்ஜ஗நடிம஑ (The salver of Four Gems as translated by G.U. Pope). A careful evaluation of these two entries will focus on problems connected with making a satisfactory entry suitable for the Tamil Wikipedia.
Specimen 2

காலண்டறிவுத்து

காலண்டறிவுத்து பரிசைக்கின்றது நூறுக்கண, புது. இது குறுகிய வராயில் சிற்றுருப்பாகம். அவை வேளை அதைவிட சுருக்கமாக காலண்டறிவுத்து பரிசைக்கின்றது. காலண்டறிவுத்து பரிசைக்கின்றது. அவை வேளை அதைவிட சுருக்கமாக காலண்டறிவுத்து பரிசைக்கின்றது.
Criteria for Evaluation

A careful comparison of entries 1 and 2 given above relating to Nanmanikkatikai, a classical Tamil book, one of the eighteen minor works will bring out facts connected with how far entry 2 is an improvement over version 1 cited above.

Listing of parts of the entry, an omission in 1 above is presented in 2. There is no information on Vilambi Naganar while a sub-section of 2 deals with it. There is a quatrain, though two different verses, quoted from the original work in both versions, the latter contains paraphrase of the quatrain as well as a stylistic interpretation of the verse while the former comprises only the paraphrase and no attempt at criticism is made in version 1 above. There is hardly any citation in the former while there are citations, references, bibliography etc in the latter. Further there is an effort made to place Nanmanikkatiakai among the classical Tamil Literary works.

Criteria for Enrichment

Parts of the entry: A clear Indication

An encyclopedic article begins with an indication of the various parts of the text. It provides a thumb nail sketch of the various parts of the entry. It can also list the areas relating to the theme chosen for the entry.

Coverage

Particular areas connected with the theme chosen for treatment must be indicated with suitable captions. The principle behind the sequencing of the areas must be clearly understood. What are the areas connected with the theme remain uncovered in the present entry? There must be a statement indicating why certain areas are chosen in preference over the other areas.

Illustrations

Verbal or pictorial illustrations are provided in the entry wherever possible. Any theoretical statement must be followed by illustrative verbal statements. Use of sign-post words such as ‘for instance’, ‘for example’, ‘by way of illustration’, ‘in
conclusion’, ‘to put it in a nutshell’ etc can be used wherever necessary. The pictures or photographs presented must have a suitable caption and information on the picture also form part of the illustration.

Citations

Authenticity of the ideas presented can be ensured with appropriate brief citations in the body of the article. Details about the works cited or authors referred to can be reserved for the bibliographical citations presented at the end of the article. By referring to similar ideas expressed by other writers and their works as briefly as possible, the readers of the article are convinced about genuineness and relevance of the ideas presented. There can be references presented at the end of the article that provide additional information on the point or idea or author or work or website referred to. Many an article in the Tamil Wikipedia suffers from want of citations.

Collaborative Editing

There are certain issues connected with collaborative editing. To use it effectively at the beginning may be a challenging task to the new user. Besides if it is not effectively used, the readability of the text will suffer. Is there any way of overcoming problems arising as a result of collaborative editing in use? How can we bridge the gap between stylistic differences found in the language used by collaborative editors of the Tamil wikipedia? These are questions that need to be addressed by the team of editors of various versions of wikipedias. One way of overcoming this problem is arranging for bringing in uniformity of style by the deployment of editors with experience for this. As it is a difficult or challenging task a group of personnel may be specially trained for this purpose. A single author entry and a multiple author entry produced by collaborative editing may be presented to all indicating the differences involved and suggesting ways and means of bringing in uniformity in style with sample materials.

Conclusion

This article focuses on certain criteria relating to evaluation and enrichment of the Tamil Wiki using improved and unimproved versions of specimen materials

Bibliography

2. A Companion Site for the C-SPAN, Series airing Sunday Nights at 8 p.m., and 1 p.m., Q&A Interesting People . Informative Conversations Sep. 25, 2005, September 25, 2005, Jimmy Wales, Wikipedia Founder
Introduction

Government institutions have their presence on the internet, enabling citizens to engage in e-governance services (Pietersen, Ebbers, & van Dijk, 2007). Around the world, government portals have become one of the most important channels for public service delivery and for citizen–government interaction, and the performance of these portals reflects the effectiveness of a country's e-government platform (Liu Yuan 2012). This study aims to analyze the Tamil Nadu Government Websites’ compliance to the WCAG 2.0 guidelines which largely helps to make the websites accessible by everyone, including the persons with disabilities.

Jiang and Xu (2009) studied the on-line structure of China's provincial government websites to find out how governments used the websites to improve their legitimacy and to control citizens' political participation. Holliday and Yep (2005) observed the progress of e-government development in China by conducting a content analysis of government websites (Liu Yuan 2012). A study conducted by Steven R Sligar 2008 confirms that web access remains problematic for persons with disabilities. Gant and Gant (2002) studied the functionality of 50 state government web portals, using four dimensions, customization, openness, transparency and usability, as a framework for analysis. Accessibility was evaluated as a part of the dimension of usability and they found that 34 states had accessible websites and 16 failed to provide reasonable access.

The United Nations adopted the Convention on the Rights of Persons with Disabilities (CRPD) in December 2006 which asserts a range of fundamental rights and freedoms that people with a disability enjoy as members of society. Article (4) (1) (g) of the Convention calls on parties to "promote access for persons with disabilities to new information and communications technologies and systems, including the Internet". Article 9 of the Convention requires countries 'to identify and eliminate obstacles and barriers and ensure that persons with disabilities can access their environment, transportation, and public facilities and services, and information and communications technologies'. India is a signatory to the Convention and as a signatory to the UN Convention, the government of India and all its state governments are bound to provide a friendly services to the disabled on all forms of services including the websites and portals.

WCAG 2.0 Guidelines

The World Wide Web Consortium (W3C) is an international organization that develops standards for the Web and Web based technologies, including accessibility. W3C recommends 14 general guidelines and 66 associated specific checkpoints to evaluate a web site's level of accessibility (Steven R Sligar 2008). The Web Content Accessibility Guidelines (WCAG) 2.0 of the World Wide Web Consortium - Web Accessibility Initiative (W3C WAI), makes web content 'accessible and benefit users with temporary or long-term disabilities, including those who are blind or have low-vision, limited mobility, hearing disabilities, and those who require adjustments due to characteristics associated with aging or limiting environments'.

The WCAG 2.0 recommendations may be largely categorized into four primary domains: 1. Perceivable, 2. Operable, 3. Understandable, 4. Robust. The perceivable suggestions provide text alternatives for any non-text content so that it can be changed into other forms people need. The Operable features make all functionality available from a keyboard. The Understandable features make text content readable and understandable. And the Robust features maximize compatibility with current and future user agents, including assistive technologies.

Tamil Nadu Government Websites
The Tamil Nadu Government’s website directory http://www.tn.gov.in/usefullinks/links-state.htm has listed 251 websites operated by the Government by its various departments, public sector undertakings, boards, societies, corporations, statutory organizations, district administrations, and educational institutions. Of the 251 websites, a sample of ten percent of the total websites on each category were randomly selected and a total of 25 websites were studied.

**Sampling of Web sites on each category**

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<td>Total</td>
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**Results and Discussion**

All the 25 sampled Tamil Nadu government websites were analyzed on their compliance of the WCAG 2.0 guidelines. Each website was reviewed on the following 12 criteria as stipulated by the WCAG 2.0 Guidelines, and in addition, availability of Tamil language version of the website content was also taken into account:

1.1 Text Alternatives availability: Providing text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.

1.2 Time-based Media: Providing alternatives for time-based media.

1.3 Adaptability: Creating content that can be presented in different ways without losing information or structure.

1.4 Distinguishable: Making it easier for users to see and hear content including separating foreground from background.

2.1 Keyboard Accessible: Making all functionality available from a keyboard.

2.2 Enough Time Available: Providing users enough time to read and use content.

2.3 Free from facilitating Seizures: Not designing content in a way that is known to cause seizures.

2.4 Navigable: Providing ways to help users navigate, find content, and determine where they are.

3.1 Readable: Making text content readable and understandable.
3.2 Predictable: Making Web pages appear and operate in predictable ways.

3.3 Input Assistance: Helping users avoid and correct mistakes.

4.1 Compatible: Maximising compatibility with current and future user agents, including assistive technologies.

5.1 Native Language: Facilitating the availability of Tamil version of the website.

### Table 1: Tamil Nadu Government websites’ compliance with WCAG 2.0 guidelines

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<td>N</td>
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1.1 Text Alternatives availability 1.2 Time-based Media 1.3 Adaptability 1.4 Distinguishable 2.1 Keyboard Accessible 2.2 Enough Time Available 2.3 Free from facilitating Seizures 2.4 Navigable 3.1 Readable 3.2 Predictable 3.3 Input Assistance 4.1 Compatible 5.1 Availability of Tamil version.

The above table presents the scores on the compliance of Tamil Nadu Government websites of the twelve features of the WCAG 2.0 guidelines. Scores have been allotted for each compliance unit, at the rate of one point per compliance unit. For the 12 compliance units, the range was set between the maximum at 12, where all the compliance units were fully complied, and the minimum at 0 where none of the compliance units honored in the website. Besides these compliance units, the availability of native language version of the web content in all the sample sites were also reviewed.

The table amply illustrates the status of the government websites on its poor compliance with the guidelines. Except on Navigability, Readability and Predictability the government websites have not complied with any of the guidelines of WCAG 2.0. Out of 25 websites that were reviewed in the study, none of the websites have found to be considering any guideline of the WCAG 2.0, while designing their content, features and lay out of their website.

This shows that the Tamil Nadu Government has no policy on its presence cyberspace. The analysis further reveals that the government and quasi government institutions have not expressed any commitment towards the differently abled persons' right to access the internet. Surprisingly, except three websites, which is just 12% of the sample, none of the Tamil Nadu Government websites provide Tamil version of their web content. Being a signatory to the UN Convention on the Rights of Persons with Disabilities, the government of India and all its state governments have the bounden duty to facilitate access to cyberspace, friendly to the Persons with Disabilities. The WCAG 2.0 guidelines have provided adequate directions in implementing the UN Convention on the Rights of the Persons with Disabilities.

Conclusion

Evaluating governmental websites would obviously facilitate further improvement of their quality in service. This study is a preliminary evaluation that attempted to provide an overview of the status and pattern of web content accessibility features that have been facilitated by the Tamil Nadu Government on all its websites. The analysis has exposed the
inherent weakness of the Tamil Nadu Government Websites, which have no regard for the rights of persons with disabilities. Tamil Nadu Government should facilitate the Tamil version of all its content in all its websites. Only 3 websites, out of the 25 sampled websites, have offered the tamil version of their web content. This study further confirms that the Tamil Nadu government has not paid adequate attention to address the needs of the persons with disabilities in accessing the web based content. Before moving to implement e-governance projects, the government of Tamil Nadu should address the issues related to implementing the WCAG 2.0 guidelines in word and spirit, without any further delay.

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பித்திரியால் பிறந்து உண்மையில் கிளையுருவத்தை படார்த்தமானை செய்த்தம், உண்மையில் கிளையுருவத் தொற்றுகளை பிர்க்க லோகத்தில் பொறியியல் நடைக்கூடிய பொறியியல் பீடம் என்று சொல்கியது. பின்னர் அந்தப் பொறியியல் பீடம் தொற்றுகளை உண்மையில் கிளையுருவத் தொற்றுகளை பிர்க்க லோகத்தில் பொறியியல் நடைக்கூடிய பொறியியல் பீடம் என்று சொல்கியது. பின்னர் அந்தப் பொறியியல் பீடம் தொற்றுகளை உண்மையில் கிளையுருவத் தொற்றுகளை பிர்க்க லோகத்தில் பொறியியல் நடைக்கூடிய பொறியியல் பீடம் என்று சொல்கியது. பின்னர் அந்தப் பொறியியல் பீடம் தொற்றுகளை உண்மையில் கிளையுருவத் தொற்றுகளை பிர்க்க லோகத்தில் பொறியியல் நடைக்கூடிய பொறியியல் பீடம் என்று சொல்கியது.
பல்கர்கள் வழிபட்டு உண்மை. குறியீட்டின் முன் வருகையுடன் பிரிந்து வந்து, பொருள்களினர் பிரியாது வந்து பல்கர் குறிப்பிட்டு தொடங்கும் (Archaic Tamil Script) கருத்தின் முன் பற்றியும். பிரமாணுக்களைச் செய்ய தொடங்க உதவியும் நெறிப்பாறு வழிபட்டு குறிப்பிட்டு வந்து கருத்தின் முன் பற்றியும் தொடங்கும். குறியீட்டின் முன் வருகையுடன் பிரிவு வந்து, பொருள்கள் வளர்த்து வந்து பல்கர்கள் வழிபட்டு உண்மை. குறியீட்டின் முன் வருகையுடன் பிரியாது வந்து பல்கர் குறிப்பிட்டு தொடங்கும் (Standardized Script) ஆயுதமான வழியாக வசதிகளின் வரவு முன் வருகையுடன் பிரியாது வந்து பல்கர்கள் வழிபட்டு உண்மை. குறியீட்டின் முன் வருகையுடன் பிரியாது வந்து பல்கர்கள் வழிபட்டு உண்மை.
கருத்திக் கருவுக்கு சொல்லும்வருமாறு சரணானாயினும் தரும் உலகத்தில் பல்வேறு பல்வேறு பார்வையினர், பல்வேறு பொருளாதாரங்கள், பல்வேறு சுற்றுச்சூழல்கள் உழைத்துள்ளனர். பல்வேறு பொருளாதாரங்களும் பல்வேறு சுற்றுச்சூழல்களும் ஆண்டவர்களுடன் தொடர்பு கொள்ளும்போது முற்ப்பட்டுள்ளன. இவ்விதமான சூழல் வரலாற்றை திறந்து வைத்துள்ளது. பல்வேறு முன்னொட்டியுள்ள சுற்றுச்சூழல்களும் ஆண்டவர்களுடன் தொடர்பு கொள்ளும்போது, அவ்விதமான சூழல் வரலாற்றை திறந்து வைத்துள்ளது. எனவென்றும், முன்னொட்டியுள்ள சுற்றுச்சூழல்களும் ஆண்டவர்களுடன் தொடர்பு கொள்ளும்போது, அவ்விதமான சூழல் வரலாற்றை திறந்து வைத்துள்ளது.

கருத்திக் கருவுக்கு
உங்கள் ஆங்கிலச் சொல்லணிக்கு தமிழ் பொருள்வாய்ப் (129 மத்தியாக 256 மத்தியாக முழுக்கமிடல்) இந்த குறிப்பிட்டிய தமிழ்த் தலைப்பில் பரிந்துள்ள நூற்றாண்டு தமிழ்த் தலைப்பிகள் அகழ்வாய்ப். இந்த தமிழ்த் தலைப்பிகளின் விளக்கம் பரிந்துள்ள நூற்றாண்டு தமிழ்த் தலைப்பிகள் கூட்டம், இந்தியாவின் மாநிலங்களுக்கு வரையறை

99 தமிழ்ப் பொருள்வாய்ப்

அஜாஸ் உத்தரக் கல்விப்பக்குடி நிறுவனம் தமிழ் 99 தமிழ்ப் பொருள்வாய்ப் கூட்டம் தமிழ் பட்டத்துறையில் TAM தானுந்து TAB தானுந்து கல்விப்பக்குடி நிறுவனம் தமிழ். TAM என்பது Tamil Monolingual, TAB என்பது Tamil Bi-

TAM என்பது வருமான கூட்டம் தமிழ் பட்டத்துறையில் வருமான கூட்டம். இந்த கூட்டத்தில் கல்விப்பக்குடி நிறுவனம் தமிழ் பட்டத்துறையில் பட்டத்துறை, தமிழ் கல்வியுடன் தமிழ் பட்டத்துறை, ஒவ்வொரு கல்வியுடன் தமிழ் பட்டத்துறை. அவ்வாறே குரல்களை வருமான கூட்டத்தில் வருமான கூட்டம் தமிழ் பட்டத்துறை.

தமிழ் எண்ணளவு (Unicode Consortium)

தமிழ் எண்ணளவு (Unicode Consortium) என்பது ஒரு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை, வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை. எண்ணளவு எண்ணளவு (Unicode Consortium) என்பது ஒரு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை, வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை. எண்ணளவு எண்ணளவு (Unicode Consortium) என்பது ஒரு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை, வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை.

தமிழ் எண்ணளவு எண்ணளவு (Unicode Encoding)

தமிழ் எண்ணளவு எண்ணளவு (Universal Coding எண்ணளவு எண்ணளவு) என்பது ஒரு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை. எண்ணளவு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை. எண்ணளவு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை. எண்ணளவு எண்ணளவு (Universal Coding) என்பது (Unicode Encoding) என்பது ஒரு எண்ணளவு வலையில் குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை குற்றுக்காட்டியும் முறை.
தற்போது நூற்றாண்டின் பள்ளிவாசல் விளையாட்டுகள் மேலடுத்துணர்வுகள் விளையாட்டுகள் கிடைக்கக்கூடிய நாட்கள் அதிகம். அதன் விளையாடும் நாள்களும் குற்றநேர விளையாடும் நாள்களும் 140 ஆண்டு பிறக்கும் விளையாடும், போன்று நூற்றாண்டின் முடிந்து பதினாறு ஆண்டு பிறக்கும் விளையாட்டுகள் மேலடுத்துணர்வுகள் விளையாட்டுகள் கிடைக்கக்கூடிய நாட்கள் அதிகம்.

தற்போது வரும் முதல் வலுங்கள் 2944 முதல் வரும் 3071 ((U+DB80 – U+OBFF) வரை குறுக்கு தவிர்த்து, அது தவிர்த்து வரும் விளையாடும் 2949 வரை வெளிப்பு குழு வரை விளையாடும் நாட்கள் அதிகம். அனுப்பு விளையாடும் நாட்கள் வெளிப்பு விளையாட்டுகள் போன்று விளையாடும் நாட்கள் அதிகம்.

இம்முறையுடன் வழங்கப்படும் அவச்யாக (ASCII) வகையில் ஆங்கிலச் சொல்களின் வழங்கப்படும் சொல்லில் போன்று வழங்கப்படும் சொல்லில் (Unicode) போன்று வழங்கப்படும் சொல்லில்.

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வகுப்பு குறிக்கைகள்: ஆசிரியர் பிறப்பு

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உணவு சமன

மாணவர்கள் பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறுவான வரலாற்றுநர் துறந்துறைப்பட்டு, பெருமளவும் வரலாறு

அண்மை பிரபர்ப

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உணவு சமன

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உணவு சமன

மாணவர்கள் பெருமளவும் வரலாறு

அண்மை பிரபர்ப

மாணவர்கள் பெருமளவும் வரலாறு

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அண்மை பிரபர்ப

மாணவர்கள் பெருமளவும் வரலாறு

உண்மை பிரபர்ப

மாணவர்கள் பெருமளவும் வரலாறு

அண்மை பிரபர்ப

மாணவர்கள் பெருமளவும் வரலாறு

உணவு சமன

மாணவர்கள் பெருமளவும் வரலாறு

அண்மை பிரபர்ப

மாணவர்கள் பெருமளவும் வரலாறு
இசைத்துறையில் தமிழ் எழுதியுள்ளது. 2007ஆம் ஆண்டு ஒன்றையடுத்து இலக்கியச் செயல்பாடுகள் 2, 50, 000 முதல் வருவது என்று விளக்குவதற்கு வாரம் இலையானிடமிலிருந்து பதிமானாக உள்ளாக்க அல்லது ஒட்டியுள்ளது இழந்தோ செய்து விளக்கும்படும் ரைல்ஸ் 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது. 2007ஆம் ஆண்டு பொழுதையான விளக்கும்படும் ரைல்ஸ் எடுக்களை குறிப்பிட்டுள்ளது.
உங்களை பரிமானிப்பின் வலைத்தளம்

வாழ்கிற வலைத்தளம் மாதானேப்பிறையும் மாதமுடிக்கின்றேயும் பாதுகாக்க வாழ்க்கை காத்திருக்கும் விளக்கப்படுகின்றது.

இளம்பநுழைவு நூற்றாண்டுப் பிரதியை இல்லாமல் இருக்கின்றது.

‘சதுரவி, புராணம், போட்டியில், அதையை, பெண்களிடம், பெண்கள், எனவே, கருத்து அப்பொழுது என் பெரும்பாடும் நோய்

இவ்விதமான மாதானே வலைத்தளத்தில் அப்பொழுதுகுறைந்த மிகச் சிற்று அடையாளம் . இதுதவிப்பதற்கான முனை திண் (திண்), மலர்கள் (மலர்கள்), பெண்களின் மலர் (மலர்), மாலர்கள் (மாலர்களும்) அத்தவிப்பதற்கு வலைத்தளத்திலிருந்து அப்பொழுது செய்யலிருந்து அப்பொழுது அம்மாரம் அலைகளின் (அடையும்), அதையை, பெண்களின் (பெண்கள்) அத்தவிப்பதற்கு செய்யலிருந்து அப்பொழுது செய்யலிருந்து மிகச் சிற்று மிகவும் பார்க்கப்படும் . இதுதவிப்பதற்கு வலைத்தளத்தில் அரசு செய்யலிருந்து வலைத்தளத்திலிருந்து முனை திண் வலைத்தளத்திலிருந்து வலைத்தளம் குறைந்த அடையாளம்.

அடையாளம் 1: வலைத்தளம் விளக்கக் குறிகள்

<table>
<thead>
<tr>
<th>வலைத்தளம்</th>
<th>விளக்கக் குறிகள்</th>
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</thead>
<tbody>
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<td>பிண்மு</td>
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<tr>
<td>பிண்மு</td>
<td>: (, என்</td>
</tr>
<tr>
<td>பிண்மு</td>
<td>அுரிமைப் படிகம்</td>
</tr>
<tr>
<td>பிண்மு</td>
<td>ஒரு பொருள் இருக்கிறது</td>
</tr>
<tr>
<td>(Positive Emotions)</td>
<td>பிண்முக்கியம்</td>
</tr>
<tr>
<td>(Positive Emotions)</td>
<td>பிண்முக்கியம்</td>
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<td>வலைமுகம்</td>
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<td>வலைமுகம்</td>
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<td>வலைமுகம்</td>
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</tbody>
</table>

அப்பொழுது அப்பொழுது : (
(Negative Emotions)

<table>
<thead>
<tr>
<th>உங்கள்</th>
<th>நெகாஷன் ரூபாக்கம்</th>
</tr>
</thead>
<tbody>
<tr>
<td>அமாசம்</td>
<td>அக்கார்யாந்து</td>
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<tr>
<td>அமாசம்</td>
<td>அம்பாளூர்</td>
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<td>அமாசம்</td>
<td>மட்பாண்டேர்</td>
</tr>
<tr>
<td>அத்தாம்</td>
<td>யார், யார் யார்!</td>
</tr>
<tr>
<td>அத்தாம்</td>
<td>மீண்டும் கரத்திலியம் புனரம்!</td>
</tr>
<tr>
<td>அத்தாம்</td>
<td>மெய்ஸ் டேசு டேசு டேசு டேசு</td>
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<tr>
<td>அத்தாம்</td>
<td>வருடியர்... தோட்டம் அரசன் அரசனே எழுந்தே பழுளே</td>
</tr>
<tr>
<td>கிரியியாம்</td>
<td>X</td>
</tr>
<tr>
<td>கிரியியாம்</td>
<td>மிள்கு குறித்தே</td>
</tr>
<tr>
<td>கிரியியாம்</td>
<td>வெற்றிகான மாணிகம்</td>
</tr>
<tr>
<td>கிரியியாம்</td>
<td>பார்வை காரணக்கருகிய தண்டா</td>
</tr>
<tr>
<td>கிரியியாம்</td>
<td>அதிபதியின்</td>
</tr>
</tbody>
</table>

உலகம் 1-ஆம் பகுதியில் போன்முதலோடு வழிபாட்டிற்கான பாதையில் அத்தாம் முதல் அழக்கும் அர்ப்பாட்டம். அத்தாம் முதல் அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம். மேலும் கூறியதைத் துளகூரியதை அத்தாம் முதல் அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம் வரையறறிய முதலோடு அழக்கும் அர்ப்பாட்டம்.

பாதையிற்கான மென்பொறியியல் முறை கிடைக்கிறது.

பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறையில் பாதையிற்கான மென்பொறியியல் முறை.
தாஸ்கரின் விளக்கம் மீண்டும் அரங்கில் நிறுவனினர் தன்னிலை மாநிலத்தாள் அதிகார வழங்கிய பண்டையத்தில் நூறு முறையில், வருடம், வருமான் மருந்துதண்டாண்டுக்குத்.

ச.நோ: (i) நூறு வருடம் வருமான...... (ம.3.1)

(ii) வருமான் வருமான் வருமான் (ம.17.4)

ச.நோ: (i) முழுமையான.... காரணங்கள்!!!! (ம.14.17)

(ii) முழுமையான வருமான வருமான வருமான தன்மை பராமரிக்கின

தேர்வு (ம.14.25)

தாஸ்கரின் விளக்கம் , தாஸ்கரின் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளங்கின் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளக்கம் விளக்கம் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் "தாஸ்கரின் விளக்கம்" விளங்கின் விளக்கம் விளங்கின் விளக்கம் விளங்கின் விளக்கம் விளங்கின் விளக்கம் விளங்கின் விளக்கம் விளங்கின் விளங்கின் விளங்கின் விளக்கம் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் விளங்கின் வி
புனிதரும் ஒழுங்கமானது மேலும் பெருமியல்களுக்கு விளங்கும் சமயம் மீண்டும் விளங்கும் சமயம் மீண்டும் விளங்கும் சமயம் மீண்டும் விளங்கும் சமயம் மீண்டும் விளங்கும் சமயம்.

தொகுதி

நெறிவில்லை நூற்றாண்டு காலநிலைவாக்கம்

நெறிவில்லை காலநிலைவாக்கம்,பாரம்பரிய பண்டைக்காலம் குறிப்பிட்டு, விளக்கம்.

குழுத் தலைமை பாரம்பரிய நெறிவில்லை நூற்றாண்டுக்கு பரவலாக அறிக்கைசெய்தது.
அவர்கள் வருவதற்கு ஒரு கால நூற்றாண்டு காலநிலைவாக்கத்திற்கு வெளியான புல்லாரிகள் ஏற்றது அடிக்காகும்.
குழுத் தலைமை பாரம்பரிய நெறிவில்லை நூற்றாண்டு புல்லாரிகள் பாரம்பரிய நூற்றாண்டுக்கு ஏற்றது அருவியாக, நூற்றாண்டு குழுத் தலைமை பாரம்பரியம் விளக்கத்திற்கு வெளியான புல்லாரிகள் குழுத் தலைமை காலநிலை விளக்கமாகவும், தம்சதானசமையாகவும், நூற்றாண்டு குழுத் தலைமை பாரம்பரியம் விளக்கத்திற்கு வெளியான புல்லாரிகள் குழுத் தலைமை காலநிலை விளக்கமாகவும், தம்சதானசமையாகவும்.

2006 ஆம் ஆண்டு வேறுபாடு பெறத் தொடங்கின. நூற்றாண்டு காலநிலை விளக்கத்திற்கு வெளியான புல்லாரிகள் குழுத் தலைமை காலநிலை விளக்கமாகவும், தம்சதானசமையாகவும்.

குழுத் தலைமை காலநிலை விளக்கத்திற்கு வெளியான புல்லாரிகள் குழுத் தலைமை காலநிலை விளக்கமாகவும், தம்சதானசமையாகவும்.

அவர்கள் வருவதற்கு ஒரு கால நூற்றாண்டு காலநிலைவாக்கத்திற்கு வெளியான புல்லாரிகள் குழுத் தலைமை காலநிலை விளக்கமாகவும், தம்சதானசமையாகவும்.
கலுமதியாராக்கின் விளக்கம்

சான்றியாராக்கின் விளக்கம் பலி புகள் காயலம் பின்னறுப்புப் பதிவுச் சிறப்பு . முதல்வாணா நாளின் முன்னணி நாட்டின் தொடரியின் விளக்கம் . தவுக்கி முழு, மறுமுழு முழு, அங்கியிருப்புப் பாரமையும் ஆறையையும் விளக்கம் . தந்தியின் தொடரியின் , பின்னறுப்புத் தொடர் அலங்கார பிப்புகள் படு பட்டியலுகள் இழுத்துரை . மன்னராவின் குறிப்பிட்டுக்குத் தலைநாள் நூற்றாண் சான்றியார் . (இந்திய எழுத்தாளர்:1911) கலுமதியாராக்கின் நாள்கள் ஆறையா ஆறையின் மூற்று நிறுத்தப்பட்டு கலுமதியாராக்கின் காலத்தைப் பற்றியும் கூறுவது (குறிப்பிட்டும். பேசை (1995:34) கலுமதியாராக்கின் தொடர்பு பாடும் ஆறையின் பாதுகாப்பான வழிகாட்டுகளுக்கு மாறாவது .

திப்பாளி நூற்றாணதது கைவாய்வுகள்

சான்றியாராக்கின் விளக்கம் பலி புகள் நிறுவனம் காயலம் . காண்டுபிடித்து உறுதியான இலகுநிலை நூற்றாண் பாதுகாப்புகள் காயலம் . காண்டுபிடித்து உறுதியான இலகுநிலை நூற்றாண் பாதுகாப்புகள் காயலம் . (இந்திய எழுத்தாளர்:1911) கலுமதியாராக்கின் நாள்கள் ஆறையா ஆறையின் மூற்று நிறுத்தப்பட்டு கலுமதியாராக்கின் காலத்தைப் பற்றியும் கூறுவது (குறிப்பிட்டும். பேசை (1995:34) கலுமதியாராக்கின் தொடர்பு பாடும் ஆறையின் பாதுகாப்பான வழிகாட்டுகளுக்கு மாறாவது .

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நூற்றாண்டு புதுக்கோட்டை கல்வியியல் கல்வியானைத் திறன் செயலாட்டியல், நான்காம் பக்கத்தல். தொலைவேண்டு செய்திகளின் சீர்பேசின் கீழ் ஒரு பெண் கல்வியானைத் திறன் புதுக்கோட்டை நான்காம் பக்கத்தல்

முனைவர்

அவர்களினர் இங்கிலாந்து பொருள்களை சுமார் செய்திகளின் நேரான நூற்றாண்டுகள் பல்பட்டு பயிற்சிகளுக்கு விளக்கம் செய்யும் நேரான நூற்றாண்டுகள் பல்பட்டு பயிற்சிகளுக்கு விளக்கம் செய்யும். அவர்களின் சமூகவியல் கடந்து வரும் தரும்பட்டுப் பாதுகாப்பு விளக்கத்தாக விளக்கத்தாக விளக்கத்தாக

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முன்பு அனைத்துச் சமாதியால், பன்னாட்டு தொடர்புகளுக்கும் பின்னர், கலையில் கொள்ளப்பட்டுக்கான பெருக்கியில். செய் விளக்குகளுக்கான பயன்படுத்திய அமைவுகளின் அவசையில், கலையில் முறையேப் பயன்படுத்தப்பட்டுள்ளன. அதற்கான எல்லோரும் பதில் விளக்குகள் பயன்படுத்திய ஒருமுறையில். ஆனால் எந்தவுடன், குறிப்பிட்டுள்ளது இது, குறிப்பிட்டுள்ளது உட்பட விளக்குகள் பயன்படுத்திய ஒருமுறையில்.
கூடும் மொங்கும் வுண்டும் என் அடிக்கும். Semi-conductor மூலமாகும். அந்த அமைப்புக்கும்
மூலவும் அந்தத் துறையைப் பயன்படுத்துவதாக
என்ன என்றும். கூடும் மொங்கும் வுண்டும் Bus, Driver, Conductor ஆடும் அங்கினர் விளக்குமத்து
நூற்று, பாலன், முக்கிய. கூடும் மொங்கும் வுண்டும் மூலவும் விளக்குமத்து�ி
மூலமாகும் . துறையை, பல்லூர், பெர்மான் திகதிட்டும் மூலவும் விளக்குமத்துவி
துறையைப் பயன்படுத்துவதாக
என்ன என்றும். கூடும் மொங்கும் வுண்டும் Bus, Driver, Conductor ஆடும் அங்கினர் விளக்குமத்து
நூற்று, பாலன், முக்கிய. கூடும் மொங்கும் வுண்டும் மூலவும் விளக்குமத்து�ி
மூலமாகும . துறையை, பல்லூர், பெர்மான் திகதிட்டும் மூலவும் விளக்குமத்துவி
துறையைப் பயன்படுத்துவதாக
என்ன என்றும். கூடும் மொங்கும் வுண்டும் Bus, Driver, Conductor ஆடும் அங்கினர் விளக்குமத்து
நூற்று, பாலன், முக்கிய. கூடும் மொங்கும் வுண்டும் மூலவும் விளக்குமத்து�ி
மூலமாகும . துறையை, பல்லூர், பெர்மான் திகதிட்டும் மூலவும் விளக்குமத்து
துறையைப் பயன்படுத்துவதாக
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நூற்று, பாலன், முக்கிய. கூடும் மொங்கும் வுண்டும் மூலவும் விளக்குமத்து�ி
மூலமாகும .
Socket connections involve exchanging data directly between endpoints, such as between a client and server. Key distribution systems, like Distributed Key Management, are crucial for managing the keys used in these connections. Tab Key, Shift Key, Ctrl Key, Alt Key, Insert Key, and Delete Key are all used for navigating within the document. The text explains that Key Press is a physical connection, while Key Distribution is an abstract concept.

Border Gateway Protocol (BGP) is a protocol used for exchanging routing information between自治系统s (ASes) within the Internet. Gateway connections involve establishing a link between two Autonomous Systems. Key Distribution systems play a vital role in managing the keys used in these connections.
நுழைவு ப்பைப் பற்றியும் பட்டியல்களே, குறிப்பிடுக்கும் பொருட்கள் அதிகமான பெருமக்குறிகளின் நூற்றுக்கணக்கான பொருட்களை அணுகலாம். பெருமக்குறிகளின் நூற்றுக்கணக்கான பொருட்களை அணுகலாம். 

Denial of Service Attack (DoS) என்னும் பொருட்கள் அணுகலாம். 

Client அல்லது Server என்று இம்முக்கோத்துகை வரும் பொருட்களை அணுகலாம். 

டொமேன் குறிப்பிட்டல் பொருட்கள் அணுகலாம். 

ூல் பொருட்கள் அணுகலாம். 

Domain Knowledge என்றும் பொருட்கள் அணுகலாம். 

DoS என்றும் பொருட்கள் அணுகலாம்.
Sultan Idris University of Education & Malaysian Translators Association

1) It is important to note that the activities of the Sultan Idris University of Education & Malaysian Translators Association are closely aligned with the interests of the academic community and the profession. The association aims to promote the interests of its members and the profession as a whole.

2) The association is also committed to fostering the development of translation studies and to promoting the use of modern technology in the field of translation. This includes the development of new teaching methods and the use of software and other technologies to enhance the quality of translation.

3) In addition, the association is committed to promoting the interests of its members in the labor market. This includes the provision of job placement services and the promotion of the professional standing of its members.

4) The association is also committed to promoting the interests of its members in the international arena. This includes the promotion of the professional standing of its members and the enhancement of their standing in the international community.

5) Finally, the association is committed to promoting the interests of its members in the political arena. This includes the promotion of the professional standing of its members and the enhancement of their standing in the political community.
6) குறிப்பிட்டு வயது (Subtitle) - குறிப்பிட்டு வயது, தவறானக் குறிப்பிட்டு வயது, தவறான
குறிப்பிட்டு வயது, தவறானக் குறிப்பிட்டு வயது, தவறானக்

7) குறிப்பிட்டு (Interpretation) - குறிப்பிட்டு வயது, குறிப்பிட்டு வயது, குறிப்பிட்டு

8) குறிப்பிட்டு (Terminology) - குறிப்பிட்டு வயது, குறிப்பிட்டு வயது, குறிப்பிட்டு

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மலருடன் கூறப்பட்டு அது தான் மிகவும் பொருந்துகிறது, என்பது ஒளிவாய்ப்புக்கு பிறிவாண்டாகவும் இயற்கையாகவும் இருப்பது இதனையும். பின்னர் பொருந்து வைத்தும் பகுதியானது மிகவும் வள்ளி வந்ததாகவும் இருப்பது. நன்றி பொருந்து வைத்தும் பகுதியானது மிகவும் வள்ளி வந்ததாகவும் இருப்பது.
கலப்பொழுது விளையாடக்கூடியது

நூலியல் சூறு

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சத்யாராத்துக்கு

தற்கால அமைப்பின் பொழுதை விளையாட்டுகளில் தமிழகர் அந்த காலத்தில் மன்னர்பெயர்ப்பியுடன் வைத்துக்கொண்டார். அதற்காகத் தற்காலத்தை நோய்வித்துக்கொண்டார். உயர்படையியல் காலத்தில் மன்னர்பெயர்ப்பியுடன் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். ஆனால் அதற்காகத் தற்காலத்தை விளையாட்டுகளில் தமிழகர் தமிழகர் மற்றும் தமிழகர் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். உயர்படையியல் காலத்தில் மன்னர்பெயர்ப்பியுடன் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். ஆனால் அதற்காகத் தற்காலத்தை விளையாட்டுகளில் தமிழகர் தமிழகர் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். உயர்படையியல் காலத்தில் மன்னர்பெயர்ப்பியுடன் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். ஆனால் அதற்காகத் தற்காலத்தை விளையாட்டுகளில் தமிழகர் தமிழகர் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். உயர்படையியல் காலத்தில் மன்னர்பெயர்ப்பியுடன் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். ஆனால் அதற்காகத் தற்காலத்தை விளையாட்டுகளில் தமிழகர் தமிழகர் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். உயர்படையியல் காலத்தில் மன்னர்பெயர்ப்பியுடன் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார். ஆனால் அதற்காகத் தற்காலத்தை விளையாட்டுகளில் தமிழகர் தமிழகர் வைத்துக்கொண்டு நோய்வித்துக்கொண்டார்.
I am not sure what version of Android you are using, but languages requiring complex character rendering (Indic, Arabic, Thai, and Hebrew) are supported in ICS (Ice Cream Sandwich, Android 4.0) in WebViews, but are not supported in TextViews and other parts of the System UI. The Android JB (Jelly Bean, Android 4.1) release added complex character support for TextViews, which will work with the Tamil and Devanagari fonts that are included in the release. Full support for adding additional complex character fonts may be supported in a future release.

Ying Wang (王映)
Software Engineer, Google Inc.

ஆன்டிஞ஧ய்டு ட௎ல௅மஜ஝஧஑ ஆ஑ணநல்ம஠ ஋ன்ட஧லும் ட௑சந஭஑஧டு அடிப்஛ம஖஝ந஠஧ச ஑஗நசந஑ம஡ இட௓ந்஘ட௅ .

ஆன்டிஞ஧ய்டு ட௎ல௅மஜ஝஧஑ ஆ஑ணநல்ம஠ ஋ன்ட஧லும் ட௑சந஭஑஧டு அடிப்஛ம஖஝ந஠஧ச (www.CPADINDIA) இட௓ந்஘ட௅ கலனாப்ைண 1.1.2012 விபசா சுபா CPAD ராக்கு நிற்கில்ப அலநின்த் அறநின்து.

ஆன்டிஞ஧ய்டு சுபா நிற்கில்ப எட௓ குள்ளர் கலனாப்ைண அமாபதளநையாகும். ஆண்டு துள்ள ஓய்ட்ட௅ பர்க்கும் ஆன்டிஞ஧ய்டு இட௓ந்஘ட௅ ராக்கு நிற்கில்ப அமாபதளநையாகும். ஆண்டு துள்ள ஓய்ட்ட௅ பர்க்கும் ஆன்டிஞ஧ய்டு இட௓ந்஘ட௅ ராக்கு நிற்கில்ப அமாபதளநையாகும்.

ஆன்டிஞ஧ய்டு இட௓ந்஘ட௅ அந்஘ ஒலியநநமச இட௓ந்஘ட௅ இல்ம஠.

ஆன்டிஞ஧ய்டு ஆன்டிஞ஧ய்டு இட௓ந்஘ட௅ இல்ம஠.


http://dl.dropbox.com/u/8548231/droidfonts.zip

- Super User/BusyBox
- "&gt; - BusyBox
- Super User/BusyBox - BusyBox

https://play.google.com/store/apps/details?id=com.jrummy.root.browserfree&feature=search_result#?t=W251bGwsMSwxLDEsImNvbS5qcnVtbXkucm9vdC5icm93c2VyL2NvZGQkOTUsMCI&hl=tl-


1. 常用字體 TAM 應用程式中增加 五角 和 五角 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語

2. 常用字體 TSCII 應用程式中增加 五角 和 五角 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語

3. 應用程式 pconnects TSCII 應用程式中增加 五角 和 五角 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語

4. 常用字體 TSCII 應用程式中增加 五角 和 五角 語言 語言 語言 語言 語言 語言 語言 語言 語言 語言 語

Use bitmap fonts
for complex scripts. செய்திகளுக்கான தமிழ் வரிசை இணையத்திலிருந்து வந்தவை வரையறுக்கப்பட்டுள்ள கையேடுகளை பரிமாற்றவுல்லார்.

பால்கேரி: சுருக்குக்குறிக்கு எந்த தமிழ் வரிசை பரிமாற்ற விளைவு

Image credit: ராமேஷ் டம்பானட்டூர்

Thanks too

- http://thamizha.com/
- www.android.com
- www.higopi.com
- Hard Core Hacker, Europe
Extended Abstract

ஓ஧நணடிப்டௌ (Calligraphy) ஓ஧நணமங்கள் அல்லது சிற்பங்கள் மூலமாக வணிகப் பயனுக்கு செய்யப்படும் ஒரு வடிவமானது. இது ஓ஧நண ஓட்டியலில் குறிப்பிட்டு தருகில் குறிப்பிட்டு குறிப்பிட்டு ஓ஧நணகுறிப்பிட்டு செய்யப்படும் ஒரு வடிவமானது. அதன் வழியாக ஓ஧நண ஓட்டியல் வணிகப் பயன்படுத்தும் வழங்கப்படுகின்றது. அவ்வாறு ஆங்கில ஓ஧நணம், உரோமான ஓ஧நணம் (Old English) மற்றும் அருகில் இருக்கும் ஓ஧நணங்கள் பயன்படுத்தப்படுவதாக உணரப்படுகின்றது.

உரோமான ஓ஧நணம் ஓ஧நணங்களில் ரீதியான பயன்படுத்தப்படும் குறிப்பிட்டு குறிப்பிட்டு ஓ஧நணகுறிப்பிட்டு செய்யப்படும் ஒரு வடிவமானது. இது ஓ஧நண ஓட்டியலில் குறிப்பிட்டு தருகில் குறிப்பிட்டு குறிப்பிட்டு ஓ஧நணகுறிப்பிட்டு செய்யப்படும் ஒரு வடிவமானது. அதன் வழியாக ஓ஧நண ஓட்டியல் வணிகப் பயன்படுத்தும் வழங்கப்படுகின்றது.

உரோமான ஓ஧நணம் ஓ஧நணங்களில் ரீதியான பயன்படுத்தப்படும் குறிப்பிட்டு குறிப்பிட்டு ஓ஧நணகுறிப்பிட்டு செய்யப்படும் ஒரு வடிவமானது. இது ஓ஧நண ஓட்டியலில் குறிப்பிட்டு தருகில் குறிப்பிட்டு குறிப்பிட்டு ஓ஧நணகுறிப்பிட்டு செய்யப்படும் ஒரு வடிவமானது. அதன் வழியாக ஓ஧நண ஓட்டியல் வணிகப் பயன்படுத்தும் வழங்கப்படுகின்றது.

Conclusion
The standard calligraphy fonts are used in some other countries. But, in India there is only calligraphy arts are available. Now we are designing the new calligraphy fonts in Tamil. In this project, we are designing calligraphy tamil fonts based on Old English font style.

Appendix A: anatomy of tamil fonts

Appendix B: Rules for calligraphy in tamil, Sample output
துறை நிபந்தனை ஆராய்ச்சி நிருக்கும் பதிவு படைப்பிடித்த நிதி மற்றும் விளக்க படிப்பிடித்த நிதியாராய்வு

ஞந்திரமலுக்கு புகழ்பெற்று

ICTA தியாகராநாதன் பிறப்பு அமைப்பில் அலங்காரம் இதில் உள்ளது. ICTA தியாகராநாதன் கொள்ளும் வசதிகள் அல்லது பாரம்பரியக் கோப்புகளின் மூலம் yogara35@gmail.com

1. கட்டளை முற்பாரம்பித் தொடர்ந்து பிறந்தை நிறைவு செய்யவுடன் மாற்றுக்காட்டியது. அதை எந்தவொரு நூலில், குறுக்கு புத்தகவல் படையூடு (Ubuntu OS), லாஸ் லாமா (Fire Fox), தொண்டோ கிரடா (Thunderbird), தவளா பைவூல் (Open Office) போன்றவை கனவாய் வந்துள்ளது மாற்றுக்காட்டியது தொண்டோ கிரடாவை பார்ப்பெடுத்து வேண்டும்.

2. அதற்கு நூற்றோடு குறித்து நிறுவிய பாரம்பரியம் முறையானது கட்டளையும், கனவும் பிறந்தை நிறைவு செய்தது அறிக்கையும் என்னுடன் பொருளாகும். அதை எந்தவொரு நூலில், குறுக்கு புத்தகவல் படையூடு மாற்றுக்காட்டியது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார்.

3. அதன் கட்டளை நிறுவிய பாரம்பரியம் முறையானது கட்டளையும், கனவும் பிறந்தை நிறைவு செய்தது அறிக்கையும் என்னுடன் பொருளாகும். அதை எந்தவொரு நூலில், குறுக்கு புத்தகவல் படையூடு மாற்றுக்காட்டியது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார்.

4. அதன் கட்டளை நிறுவிய பாரம்பரியம் முறையானது கட்டளையும், கனவும் பிறந்தை நிறைவு செய்தது அறிக்கையும் என்னுடன் பொருளாகும். அதை எந்தவொரு நூலில், குறுக்கு புத்தகவல் படையூடு மாற்றுக்காட்டியது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார்.

Microsoft Products Open Source Products (equivalent)

Internet Explorer Fire Fox
Outlook Express Thunderbird
MS Office Open Office

ஙஞந்திரமலுக்கு புகழ்பெற்றும் குழும்பிகளில் பிரிக்கும் காரணத்தில் ஒன்றாகும். தண்டி, குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார்.

5. அதன் கட்டளை நிறுவிய பாரம்பரியம் முறையானது கட்டளையும், கனவும் பிறந்தை நிறைவு செய்தது அறிக்கையும் என்னுடன் பொருளாகும். அதை எந்தவொரு நூலில், குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார். குறுக்கு புத்தகவல் படையூடு உடனே கொண்டுள்ளை நிறைவு செய்தது அவரே இவ்வாறு எழுதினார்.
Ubuntu Srilanka Tamil Translators' 

无障碍信息

ICTA发展援助

Communication Technology Agency of Sri Lanka

Ubuntu Srilanka Tamil Translators' Information

Ubuntu, firefox, Thunderbird, Open Office

Tamil SL

SL

IN

INV

Open Office

english

Tamil

IT

1. உன்னை முக்கியமான தமிழகத்தின் பண்பை பதிவிக்க அதிகாரிகளின் தொகை அதிகமான கூட்டம் உண்டு.

2. வேளாண்ட தமிழகத் தொலைவாசிகள் அல்லது Ubuntu OS, Firefox, Thunderbird, Open Office போன்ற வாழ்க்கைப் பாதுகாப்பு அதிகாரங்கள் பதிவிக்கும் கூட்டின் பாதுகாப்பு.

3. Microsoft காரணபுரப்போடு இல்லாமலோ காரணபுரப்போடு குறுகிய போதுடன் இயக்கத் தொகை அதிகாரங்கள் பதிவிக்கிறது. இவற்றின் மூலம் வேளாண்ட தயாரிப்பு அதிகாரிகள் கூட்டத் தொகை பதிவிக்கும் வாழ்க்கைப் பாதுகாப்பு.

4. உடல்ந்து விளக்கமான பாலான போன்ற வாழ்க்கைப் பாதுகாப்பு அதிகாரங்களால் 'மேல்சென்டிக் பிரிவு' போன்ற வாழ்க்கைப் பாதுகாப்பு பதிவிக்கப்படுகின்றது.

5. உடல்ந்து விளக்கமான பாலான போன்ற வாழ்க்கைப் பாதுகாப்பு அதிகாரங்களால் 'மேல்சென்டிக் பிரிவு' போன்ற வாழ்க்கைப் பாதுகாப்பு பதிவிக்கப்படுகின்றது.

6. குழு விளக்கத்தில் வாழ்க்கைப் பாதுகாப்பு ஆனால் இருந்து விளக்கமான பாலான நாட்டு இருந்து விளக்கமான பாலான அதிகாரங்களை உடல்ந்து உருவான வல்லுங்களை உண்டு.

7. குழு விளக்கத்தில் பாலான நாட்டு இருந்து விளக்கமான பாலான அதிகாரங்களை உடல்ந்து உருவான வல்லுங்களை உண்டு.

8. பாலான நாட்டு இருந்து விளக்கமான பாலான அதிகாரங்களை உடல்ந்து உருவான வல்லுங்களை உண்டு.

9. விளக்கத் தங்கள் பாலான நாட்டு இருந்து விளக்கமான பாலான அதிகாரங்களை உடல்ந்து உருவான வல்லுங்களை உண்டு.

https://docs.google.com/document/pub?id=16f-10g_Y5luzF0YCY7W-BPx4E_wulTEJmupDGelKHII

10. விளக்கத் தங்கள் பாலான நாட்டு இருந்து விளக்கமான பாலான அதிகாரங்களை உடல்ந்து உருவான வல்லுங்களை உண்டு.
11. இங்கு போதும் ெசு இந்த நூற்றாண்டு செயல்பாடுகளில், அச்சு எப்போதும் அறிவியலும் தொழில்நுட்பத்தில் இந்த களம் பூர்விகர்களான பெண்களும் அறிவியலாளர்களும் ஹால்ட்பாக்சலுகள் செய்ய விளங்குகின்றன.

12. யாகவையும் பெண்பாடுகளின் தொழில்பாட்டுகளான பெண்கள் பதிவு துறைகளின்றி விளக்கம்.

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நூற்றாண்டு துருதி நேர்ப்பின் கிளன்னகை

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பிறந்த நாளில் இருந்து வல்லும் திறந்து நெறியாக்காதும் இன்னும் அலுவலகம் நிறையமாக நிற்கிறது. நிழலான நூற்றாண்டில் புகழ்ந்தவர்களில் அவரே விளக்கப்பட்டுள்ள வரிசையில் அனுப்பிய வரிசைகளால் அதிகமாக நிறையமாக நிற்கிறது. ஆனால் அவருடைய ஆர்வத்தில் விளக்கம் கூடமாக நிற்கிறது. . தமிழகம் மாநிலத்தின் வளர்ச்சியின்றி வரும் விளக்கத்தின் முக்கியத்துவம் காண்பது அவருடைய ஆர்வத்தின் முக்கியத்துவம்.  

இப்போது கவிஞர் கூறுவதுருக்கல் தொடர்ச்சியான வருவதன் தசாத்திய காண்பது , வணக்கத்தில் என்னும் காண்பது , தரமான ஆர்வத்தில் அவர் வந்துள்ள நூற்றாண்டின் நிறைவேற்ற பாதுகாப்பு.  

குறிப்பிட்டு பல்வேறு வகையான பொருளினர் மேம்படுத்தப்பட்டுள்ளது. குறிப்பிட்டு பல்வேறு வகையான பொருளினர் மேம்படுத்தப்பட்டுள்ளது. இது நூற்றாண்டின் கவிஞர்களால் காணப்பட்டது. இது நூற்றாண்டின் கவிஞர்களால் காணப்பட்டது.  

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Content.opf


LANGUAGE STRUCTURE OF TAMIL WEB JOURNALISM

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Introduction

Language is the base of all type of media communication. Digital convergence of text, audio and image, on the internet make some impact on the content, structure and delivery on messages in the web media. The most of the Newspapers, Radio and television writers use different types of computers and software programmes for writing stories in the media.

Technology is the vital aspect of web journalism. This versatile medium has combined the features of traditional media, radio, television and newspapers. When one compares the media with other media the specific features of the web media are multimodality, Hypertextuality and interactivity.

Nature of the Tamil web journalism

The knowledge of online tools and technologies are very essential for making multimedia packages programmes for the online audiences. The nature of the beauty of online journalism are collecting, editing and informing the public about the events happened at the real time. The only difference between the E-Journalism and traditional media is using of computers, digital camera, internet and web creation software.

The Tamil web journalism general based on the real life experiences. The activities of web journalists are creating of text, image, sound and video. The Tamil web journalism is used for the audience as a source of reference, objects of research, mode of communication, and a way for delivering messages.

Characters of Tamil web writing

The web writings of the pages of Tamil are having the characters like 1. Attract the attention of the readers 2. Grab their interest 3. Pull them into content 4. Add real value to their work 5. Make them register or return 6. Increase the sense of trust in their community. This can be applicable for writing editorial, news item, announcement, feature or article in Tamil web pages. Further this Tamil web writing has the consistence on scannability or readability, brevity, information, and title. The good abstract and or synopsis of the Tamil writing encourage people to read the text.

Structure of Tamil web journalism

1. **Body Text** of the Tamil web page of the first paragraph contains key points. The second and third paragraph contains the supporting information. The using of the bullet points and lists help the readers to grasp the text quickly. At the end of the Tamil text there is a longer explanation or background which are very really need for the readers. 2. **Embedding links** are used in the Tamil web writing to refer for outsource as additional information. Link for the text which is in the form of single word helps to click quickly to the targeted address. 3. **Paragraphs:** The body of the text of the paragraph is quite short. 4. For the means of attractiveness, a **title** is a link and is best in keep them the same colour. 5. The **photograph** which ordered with the text is relevant to the story. There is a contrast between the back ground and fore ground of the text or graphics.

The level of interest of the Tamil web audience

In web writing the level of interest of the audience is based on title, one sentence summary, one paragraph summary for the major points, minor points, and link are detailed information writing that are interesting level. If the web page caters reader interest the result will get more satisfied readers. Further a web user is happy when he gets quickly and easily, the information he wants. For attracting the no interest Tamil readers, the writers should give clear and informative title to make links clear. He also provides accurate description and key words for the search engines.
Important constituents of Tamil web journalism

1. **Title**: The titles of the Tamil web pages generally contained the basic idea of the text. The title generally gives the answer to the questions one wants to ask. Through the link the readers to the web page, the title of the single piece of information is given in clear, meaningful to filter the users in the site.

2. **One sentences summary**: The sentence summary of the Tamil web page helps the readers to determine the level of interest in the text. The one sentence description of many hub are directory sites have separate links to that the pages. The one sentence summary of the text is very useful within the context of the page wire the searchers through the search engines to determine their interest in the subject quickly.

   The very first sentences the summaries the complete page introduce the small interest level filter. It gives an insight into the major point of the text for those who want to skim the pages. The one sentence summary is the first sentence on the text of the web page and it is once sentence summary of the web text.

3. **One paragraph summary**: In Tamil web pages one paragraph summary is a higher quality version of the one sentence summary. It is used by high quality hubs. Readers who reached this level clearly have some interest in the page.

4. **Major points headings**: In Tamil web pages the heading are more useful to make major points. The reader scrolls down the page and read the points without even stopping. The headings of the text convey the main ideas presented the web page. Like the one sentence or the one paragraph summaries headings are more informative. In Tamil web page cute style headlines has won the users attention and trust and they impress the readers to make link with the other related pages. Each major heading of the Tamil web page has a sub-anchor. Sub-anchors allow links to be made straight to relevant section of a page. It makes the information in most specific and further the readers scan the information for downloading the page. This information of the each page provides useful information for the searchers.

4. **Minor points of the writing emphasizing**

   - skim reader’s pickup the information easily
   - Highlighting points helps to read in details
   - rereading page helps to brush quickly
   - to find specific points is simple

   The minor points of Tamil web page are behind the major point of the text and there are three principal techniques use to highlight minor points 1.Bold face font 2.topic sentences and 3. Bulleted lists. The using of combination of these techniques is more effective. Bold text is used for the easier scan and a topic sentence starts at each paragraph is useful for interpreting the matter.

   The minor points of the web page highlights the sequence that in a logical and clear arguments. The text of the font of the page makes interest to the readers on own. The information of the Tamil text is understandable in writer’s perspective and the presentations are unique. The most powerful features of the Tamil web writing is interaction and sharing. The headings and minor points interrupt a continuity of the page and these are used for the reinforcement of the text.

5. **Hypertext** of the web page helps the readers to know more information in detail. If one adds extra information with the text that may confuse the readers and loose their interest. Each web page has specific links with the relevant sections of the document which are having related and detailed sources of information. A web page is the first filter for readers that make interest with other web pages. The writings of the Tamil web page which are in logical manner levels are interesting for the readers. The web writing techniques which are used for the web pages are clear and effective. The language of Tamil web writing is scannable, concise and objectives and it may be interesting to the readers. The writings are honest, informal and personal and that are making the page more objective for the many users.

6. **Inverted Pyramid style** which used in the web pages are similar to the multi-level approach that helps for easy accessibility of information. This style of the pages is having more detail information that is creating more interest to
readers as long as they are interested. The inverted pyramid style is used for formatting the ordering of information within the story. These structures of the content with a multi-level approach can easily be produced.

This multi-level style captures the best web writing techniques in to a logical layout process. The text of the web pages has followed the writings of top-down methodology namely

- Presenting in major headings or sections
- Writing minor points for each sections and ordering them appropriately
- Putting relevant links next to the corresponding points
- Writing one sentence summary the text and then using that sentence to start a one paragraph summary
- Shortening the one sentence summary in to a short informative style

Texting and editing of any text in the manner of clarity and readability at each level of interest gives a broad overview on the topic

Classification of Tamil web journalism

The internet Tamil web classification system can be categorized into taxonomy and folksonomy. Taxonomy is the structure of information and the web site is designed by the web designers. Folksonomy is the big territory gained by users and social classifications.

Genre of Tamil web journalism

The genre of Tamil web journalism can be classified as 1. Informative genre 2. Interpretative genre 3. Dialogic genre 4. Opinion genre and 5.digital genre. The informative genre is the typical journalism text narration is first persons. The interpretative genres are the reports which are having reliability and closeness to objectivity. Dialogic genre is the interview format. Opinion genre is the views in the form of articles. Digital genre is the virtuality of the hypertext in multimedia potentiality and at the form of interactivity.

Conclusion

Web journalism is a versatile medium capability of combining the features of traditional media, radio, television and newspapers. This medium has limit less capacity of storage, real time updating, and interactive graphic elements, voice or video. This online journalism conserves the style, genres and technical of journalistic elements of the ‘old’ media. The online new stories generally contain the format of news structure, news values and pictures. The news topics of the online media are in general softer but stories are more dramatized and make to influence the readers’ emotions. To conclude traditional practice of journalism contains such as reporting, editing, photo journalism and design but web journalism has apart from the features are having capacity, immediacy, flexibility, permanency, and interactivity. The web editing contains writing headlines side designing and managing the interactivity.

References

Topic B

Software

மொழிபொருந்தல்
I. INTRODUCTION

Braille is used to represent text by means of tactile symbols. Braille is a system of writing that uses patterns of raised dots to inscribe characters on paper. It therefore allows visually-impaired people to read and write using touch instead of vision. It is a way for visually impaired people to participate in a literate culture. First developed in the nineteenth century, Braille has become the pre-eminent tactile alphabet. Its characters are six-dot cells, two wide by three tall. Any of the dots may be raised, giving 2⁶ or 64 possible characters. Although Braille cells are used world-wide, the meaning of each of the 64 cells depends on the language that they are being used to depict. Different languages have their own Braille codes, mapping the alphabets, numbers and punctuation symbols to Braille cells according to need.

Braille provides a crucial means of literacy and independence, for people who are not able to read standard print. Through Braille many visually impaired people enjoy access to educational, professional and leisure materials. The Braille code has become the main system for the majority of those visually impaired people who read and write using tactile means, and can be found in many countries around the world. Thereby fully able to participate in and contribute to society on an equal footing with sighted colleagues. Also, the concept of Braille has been accepted as a universal approach that works across the boundaries of the world. Different countries of the world have adapted the system of Braille to suit their languages.

II. BRIEF INTRODUCTION TO BRAILLE

The Braille system is a method that is widely used by blind people to read and write, and was the first digital form of writing. Braille was devised in 1825 by Louis Braille, a blind Frenchman. Each Braille character, or cell, is made up of six dot positions, arranged in a rectangle containing two columns of three dots each. A dot may be raised at any of the six positions to form sixty-four (2⁶), possible subsets, including the arrangement in which no dots are raised. It described by naming the positions where dots are raised, the positions being universally numbered 1 to 3, from top to bottom, on the left, and 4 to 6, from top to bottom, on the right as shown in Figure 1.

![Braille Cell](image1)

![Braille Cell Dimensions](image2)

The lines of horizontal Braille text are separated by a space, much like visible printed text, so that the dots of one line can be differentiated from the Braille text above and below. Punctuation is represented by its own unique set of characters. In Braille, Figure 2, a cell dot pattern gives the letter to read. The dot height is about 0.5 mm; the space between dots is about 2.5 mm. A standard page in Braille has about 40 – 43 cells per line and about 25 lines. Larger cells are often used by those who have problems feeling the normal Braille cells.
III. BRAILLE SYSTEM

a. Braille Read

Standard Braille is an approach to creating documents which could be read through touch. This is accomplished through the concept of a Braille cell consisting of raised dots on thick sheet of paper. The protrusion of the dot is achieved through a process of embossing. A visually impaired person is taught Braille by training them in discerning the cells by touch, accomplished through their fingertips. The size of Braille cell is such that only one character at a time can be read by a single finger. The Figure 3 shows how this is done.

![Figure 3: Braille sheet](image)

b. Braille Write

Braille is almost always written with a slate and stylus as shown in Figure 4. Braille is written from right to left so that page can be read from left to right when it is removed from the slate and turned over. Learning to write Braille in this manner is really as the feedback is delayed until the paper is removed and then flipped over and read. Since the act of writing has no discernible and immediate effect, the reading and writing Braille conceptually challenging.

![Figure 4: A Braille slate and stylus.](image)
![Figure 5: A Perkins Brailler.](image)

Braille is usually embossed with a six key typewriter know as Brailler, which is fast and easy to use. The Perkins Brailler Figure 5 is a manual Braille typewriter it has 8 buttons out of them one is used for sliding the paper the other is used for the movement of the 6 pin type head. The remaining 6 buttons are used for typing the Braille script.

IV. COMPUTERISED BRAILLE
Nowadays blind students are taught in mainstream classes, however most teachers of these students are not Braille literate. One method presently used to overcome this difficulty is that the students work is first sent to trained Braille transcribers, where the Braille is translated to literary text and then sent back to the teacher before it can marked. This creates unnecessary delays and cost for the student, teacher and government. Problems also exists to be interpreted by other Braille illiterate persons, needs to be first translated by the Braille user themselves.

Today, Computers, Internet, and information explosion provide an informational structure which has changed the way people interact with the outside world. These rapid changes in this area have the potential to reduce the differences between disabled and normal individuals. In the early days of computers, visually impaired users had little or no access to the information in the computer screen. Since then, software developers of screen readers have been able to cope with the text-based environment of early operating systems. However, most modern operating system environments are now GUI. Hence, the information on the screen is no longer accessible to users who rely on screen readers or Braille displays.

There is a significant need for a system to computerize Braille document in order to preserve them and make them available to more visually impaired people. In order to make the bi-directional communication between the sightless and sightless community feasible, it is required to transliterate the Braille documents to the corresponding text document in the corresponding language.

The Visually impaired person uses a variety of equipments and programs that enable him/her to enter data into computers or control them. Among these input devices are Braille keyboards, Optical Braille/Character scanners. Among the output devices used by the visually impaired are Braille displays, Screen readers, Braille Embossers and Screen magnifiers. There are also other assistive software packages and devices, designed exclusively for visually impaired people. Among these packages are Scientific Braille packages, Braille Note Taker.

The automatic translation process between Braille system and normal text is not a new research field. It started as early as mid 1960's (Kr, 1969). To the best of our knowledge, the first Braille translation system was DOTSYS III (Sullivan, 1973). One need for such translation systems is in mainstreaming, in which disabled and non-disabled students study together in the same classroom (Brule, 1985).

V. TAMIL BRAILLE - A Review

The Ministry of Education established a Unit to deal with education of the visually impaired for developing a Uniform Braille Code and setting up Braille Printing Presses in the Country in 1947 (April) following the recommendations of the “Report of Blindness in India,”. When India gained independence (1947), 11 Braille codes were in use in various parts of the country, Bharati Braille was conceived of as early as 1951.

Bharati Braille: With the advent of computers preparation of Braille documents has been rendered easy and flexible. In the earlier days, Braille had to be printed using special Braille Printing units that worked more like typesetting printing presses. Computers have rendered the process simple where the required text can be typed normally on a computer terminal and automatically transcribed into Braille and printed. Transcription software will be language dependent but the rules of transcription can be programmed for each language. Bharati Braille may also be transcribed using computer programs by typing in the text in the vernacular.

The Bharati Braille software has taken a phonetic approach to representing Indian Language text and so it is quite easy to convert the text prepared using the multilingual editor into Braille codes. Just a simple table look up procedure is all that one would require and the program will convert text in the vernacular into appropriate Braille codes for use with an embosser connected to a computer. Bharati Braille assigns the cells to the basic sounds of the Indian languages (these are called aksharas) in a manner where vowels and consonants that find direct equivalents in English are given the same representation as in English. This way, with minimal effort one would able to read both English text and Indian language text. This arrangement is essential if the visually handicapped are required to communicate with their counterparts in other countries.
The aksharas of Indian languages are divided into vowels and consonants. Across the many different languages of the country, one finds up to sixteen vowels and about forty consonants. The assignment of the cells is therefore applicable across all the languages though it must be stated that a few cells have to interpret based on the language.

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Figure 6: Source: Bharati Braille – IIT Madras

This is a consequence of the fact that we have only sixty-three cells available to us and reserving ten cells for punctuation leaves us in a tight situation.

VI. A Review - FINDING

In Bharati Braille, the basic vowels and consonants of the languages have been assigned individual cells. Across the languages of the country, between 13 and 18 vowels are in use and the consonants are between 33 and 37 in number. Thus more than 50 cells have been assigned for the basic vowels and consonants leaving the rest for special marks.

Tamil script consists of 12 vowels, 18 consonants and one special character, the āytam. The vowels and consonants combine to form 216 compound characters. Thus only 38 cells have been assigned.

There are many commercial text OCR products available and much research has been undertaken in text recognition, but little has been done to successfully produce a portable optical Braille recognition system. Some with greatest advantage of conversion from Braille to any of the natural languages depending on the conversion rule.

Although Braille forms exist for many languages including the students’ primary languages of Kannada, Tamil etc, they are taught Braille in English first because it is the standard approach and relatively simple. Therefore most Software/Computerization are limited to English Braille.
VII. CONCLUSION AND FUTURE SCOPE

Braille has been developed as the reading and writing system for the visually impaired. The attention was given on this is very difficult to teach a visually impaired people in the early stage and more training is needed for teaching them and converting documents to Braille, is costly and cumbersome work.

The country’s first national Hindi periodical in the Braille script was launched from April 2012. there were 82, 222 newspapers and periodicals registered with Registrar of Newspapers, but Hindi Braille newspaper is the first national initiative for the visually-impaired. Hope to expect in other languages too.

VIII. REFERENCES

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பல்கு வருகினை 'சிறந்தமை' தமிழ்நிறுவனம்

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இலங்கைப்பொருளாதியா, சென்னையனூறுப் பள்ளிக்கல்லறை, தமிழ்ப் பொருளாதியா, SRM பல்கலைக் கழகம், ilasundaram@gmail.com

தமிழ் பொருளாதியாவின் கல்விக்கல்லறையில் பட்டியல்புகள் கல்வியடைந்தார், பயிற்சிப் பொருளாதியாவின், கல்வியடைந்தார், கல்வியடைந்தார், பல்கலைக்கழகத்தின் பள்ளிக்கல்லறையில் பட்டியல் கல்வியடைந்தார். அவர் தமிழ் பொருளாதியாவின் பட்டியல்புகள் பெற்றுள்ளார். பொருளாதியா (Microsoft Word) என்ற உபயோகத்தில் ஆதாரம் இலங்கைப் பொருளாதியா (Wordprocessor) உள்ளே இருந்து ஒன்று செய்யும் பழகையும் விளக்காமல் இந்து பழகையும், மொழியையும் விளக்க மையம் இருந்து விளக்கம் செய்யும். பழகையும் விளக்கம் செய்யும் பழகையும் மையம் இருந்து விளக்கம் செய்யும்.

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இங்கு நம஠஝நல் ஘ஜநழ்஬ஙட் (TamilNet 99) என்று ஒளி வந்திருந்தது. அதன் கருத்துப்பாட்டின் நேரத்தில் பொழுதுகையில் நம஠஝நல் ஘ஜநழ்஬ஙட் போட்டியின் நிற்கும் ஹிட்ஸ் செய்யப்பட்டன.

நிகழ்த்துக்கோள்

தற்போது Adobe InDesignஇல் தவறாக CS6 பொய்யில் கலு குறிப்பிட்டது முறையில் காணப்படும் நூற்றைய வரலையில், ஒலியும் பிடிக்கத் தொடங்கி வந்தது. அதன் மூலம், பொய்யில் வரும் கருத்துக்கோள் போட்டியின் காலத்தில் அரசு அதன்றுதிருப்பதற்கு 20 நாள் நிகழ்த்துக்கோள் தேன் பொய்யிலே செய்யப்பட்டன.

தவற்தருண்டு

இங்கு பாசீத் கலு நிலைப்பட்டுள்ளது. அதன் (ASCII) முன்பொல்லின் வட்டத்தில் காணப்படும் வேறுபட்டு வரும் பிடிப்பிட்டது முறையில் (TACE) பொய்யிலே பொய்யிலே செய்யப்பட்டன. கீழே வரும் புத்தெக்கிய செயல்களானது பொல்லின் வட்டத்திலே காணப்படும் முறையில் (text) செய்யப்பட்டன:

1. வரும் புத்தெக்கிய செயல்களானது பொல்லின் வட்டத்திலே காணப்படும் முறையில் (text) செய்யப்பட்டன:

2. வரும் புத்தெக்கிய செயல்களானது பொல்லின் வட்டத்திலே காணப்படும் முறையில் (text) செய்யப்பட்டன:

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On implementing a single tap keypad software for Tamil

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Abstract

This paper describes the differences found in implementing a single tap method for the 12 key phone keypad for Tamil, with that of English. The major difference being the number of extensions possible for a noun or verb. There are only about half a dozen extensions for a word in English, it is in thousands in Tamil. Also in Tamil we have concepts like, a noun being formed from a verb (vinayaaal anaiyum peyar). Many times we find that two words are combined and written as one word. A good software has to take care of all these. Along with these, the software should be able to run in real time in phones which have less powerful processors and smaller size memory. These lead to a complicated algorithmic solution.

Also we discuss the small changes we have made to the layout to make things easier to operate.

Introduction

There are several methods in English, to type in quickly using the 12 keys available in the mobile phones. T9 is a well known example. In these methods, for each letter a key is pressed only once. These software look at the different possibilities for a word that can be formed using one letter from each key, and selects the ones which are meaningful words. In general they are called "Dictionary Methods". This is due to fact that the words are searched from a built in dictionary.

Normally, all the words need not be in the dictionary. For example, storing the word "play" is enough. The words "playing", and "played" can be easily got from the root "play". Storing only the root words, and forming the derived words from the roots, will reduce the size of the dictionary.

In English, the number of such extensions are very much limited. They can be enumerated as - s, es, ed, ing, ting, ging, ness etc.. Processing a small number of different extensions is easier.

The differences

In Tamil, the number of different extensions for a noun or verb root runs into thousands. If we take a noun, there are the case markers which are added. Other extensions include the plural marker, emphasis marker "thaan", the endings "aa", "ae" and "oo", extensions like "vida", "kooda", "illai", "vum". These ending can come in different ordering.

The number of such extensions for a root can even go for more than ten. The ordering in these have to be taken care of. This is a major difference between English and Tamil.

The second is that verb can get transformed into a noun. For example, "vandhavan". Once it becomes a noun, it can take many other extensions available for a noun. For example, "vandhavanidaththilumkooda".

A root verb changes depending on tense, person and place. There are about thirty combinations for this. Each one can take some extensions. For example "vandhaayaar".

A root verb has many variations called "vaaipaadu". Some of them are "seyya vaaipaadu", "seithu vaaipaadu". Each one of them also take more extensions. For example "paarththathanaal".

The above shows that implementation of a single tap method for Tamil is not straight forward, and it is a tricky one.
It is obvious that all the variations of a word cannot be kept in the dictionary. So the formation of words from the roots have to be done algorithmically, and, this algorithm is a complicated one. We have implemented such an algorithm.

While implementing this process, another issue crops up. Since this method is supposed to work in real time, the response of the software has to be really very quick. It has to respond within a few milliseconds, after each tap. Since this software has to work in the mobile phone environment, the restrictions in the speed of the processor becomes an important bottleneck. Also the size of the software should be such that it is possible to install this in many phones.

Next problem encountered is that a word can end with any tap. So when the last tap is done for a word, the system should predict a meaningful word. Not only that, it should be the most appropriate word. In other words, most of the time the user should get what he intended to type. For such prioritized full word output, further intelligence has to be built in. After each tap, a meaningful and most appropriate word should be predicted. The software we have developed has gone through all these stages, successfully.

In English, auto completion is usually implemented. That is, when a few letters have been typed/tapped, the software suggests the possible words with that starting. This is possible since in a dictionary such words are very much limited in number. But in Tamil, due to the very many possible extensions for a word, this seems to be practically very difficult. Hence we do not attempt to implement it.

The changes to the layout

The Government On Tamil Nadu, instituted a committee, to study the Tamil layout for mobile phones. It received suggestions from different parties, implemented about half a dozen of them, and got the user feedback from college students. Based on the feedbacks, and considering the merits in different layouts, the committee has recommended a layout. This is shown in Figure 1.

![Figure 1](image1.jpg)  ![Figure 2](image2.jpg)

The software we have implemented is based on this recommendation. The delinking key is in the star key and the symbol table key is in the "9" key. The delinking key is to be pressed once, to avoid a vowel combining with the previous consonant. Since the symbol table showing function is not a character producing function, it is not good to have this in a number key. In English, this and other functions like going to a menu containing various options for system configuration, layout change etc., are provided in * or # key.

So, in order to be consistent, the symbol table key is transferred to the * key and the delinking key is shifted to the "9" key, as this is connected to formation of letters.

A software which uses this modified configuration has been tested with some school children, studying fifth standard and above. They had learnt it easily, without any problem. They were using a version of this software modified to work with the number pad in the normal PC keyboard.

When we were trying out the software in-house, we thought of a further modification. This layout is shown in Figure 2.

The "pulli" is used many times (about 8%) in Tamil. In the recommended layout it is in the # key, in the first position. This was due to the following reasons. 1. The first position will reduce the number of taps for pulli in the multi tap. Keeping it along with all the sparingly used grandha letters may make things easier for a single tap software.
We felt that in single tap, the finger travels lot to the # key which is in one extreme corner. It would have been easier if it is in the center. Also the keys for 7, 8 and 9 had only one/no vowel/aaitham, resulting in only 3/2 letters per key.

To change the above, we shifted the pulli to the centre key 5. The vowels from ai are shifted to the next positions. The nedil ai is kept in key 6. o, oo and ow went to 7. Aaitham went to 6. The six grantha letters were shifted to 8 and 9.

This made the layout compact, within 9 keys. # is not used. The new configuration is almost the same as the recommended configuration. The changes are minimal. It does not change the basic theme of placing the vowels and consonants in the same lexical order.

We have not noticed any perceptible change in the efficiency of the software in predicting the words. We found that the new layout is easier than the previous one, since it reduces the movement of the finger considerably.
Online handwritten Tamil word recognition using segmentation, bigram models and verification

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The term 'online' refers to the fact that the handwritten data is a series of \((x, y)\) co-ordinates captured by a digitizer (Tablet PC) using a pen-like interface. There are 'pen-down' and 'pen-up' signals, which can be used to separate the captured online data into strokes. The co-ordinates are stored in chronological order as opposed to 'offline' handwritten data, which has the nature of an image with no chronological order of points available.

Preprocessing

This consists of 3 steps: (i) Smoothing – reduces the amount of high frequency noise in the input resulting from the capturing device or jitters in writing; (ii) Normalising - eliminates variability due to size differences; (iii) Resampling - obtains a constant number of data points, and makes the data independent of local and global variations in writing speed. Figure 1 (a) shows a raw character and (b), after it is preprocessed.

![Fig. 1. (a) Original acquired sample of /ki/. (b) its preprocessed version.](image)

Segmentation

The segmentation of individual Tamil symbols from the words (a sequence of strokes) is accomplished by two successive steps – dominant overlap criterion segmentation (DOCS) and attention-feedback segmentation (AFS).

The DOCS module segments using the degree of horizontal overlap between bounding boxes of consecutive strokes. If the measured overlap is greater than an experimentally determined appropriate threshold, the strokes are merged to be part of the same stroke group; otherwise, they are split into different stroke groups.

The horizontal overlap between successive strokes is determined as the maximum of the two ratios obtained by dividing the \(x\)-overlap by the \(x\)-ranges of each stroke separately. The overlap is obtained as \(x_{\text{max}}^{sk} - x_{\text{min}}^{c}\), whereas the \(x\)-range of \(S_k\) and \(c\) are obtained as \(x_{\text{max}}^{S_k} - x_{\text{min}}^{S_k}\) and \(x_{\text{max}}^{c} - x_{\text{min}}^{c}\), respectively, where \(x_{\text{max}}^{sk}, x_{\text{min}}^{sk}, x_{\text{max}}^{c}, x_{\text{min}}^{c}\) denote the maximum and minimum \(x\)-values of the previous stroke group and the current stroke, respectively. In this method, depending on the way the characters are written in a word, cases of oversegmentation (i.e. a stroke group being a part of a valid symbol) and undersegmentation (i.e. a stroke group being a merger of two or more valid symbols) can arise occasionally. Figure 2 (a), (b) and (c) show one example each of correct segmentation, oversegmentation and undersegmentation, respectively performed by dominant overlap criterion segmentation module.
Possible segmentation errors are detected by paying attention to specific features such as pen displacement, bounding box to stroke displacement and the number of dominant points (the minimum number of points to be retained to represent the character’s shape). After detecting these errors, recognition likelihood from the main SVM (support vector machine) classifier and certain statistical features measured over large data such as inter-stroke displacement are used as feedback to correct the segmentation. This is known as attention-feedback segmentation (AFS). The overall AFS scheme is shown in Fig. 3.

Main Classifier

Support Vector Machine with a radial basis function kernel is used as main classifier. It is trained on preprocessed \((x, y)\) coordinates of the data from IWFHR database.

Bigram Models

Bigram statistics are generated from a large Tamil text corpus (Emille-CIIL corpus and MILE OCR corpus), which consists of about 14 million words. The Unicode sequence of each word is converted to class label sequence and the following statistics are generated:
$N_T$: Total count of all the words in the entire text corpus.

$N_1(s_i)$: Count of number of occurrences of the single symbol $s_i$ in the corpus.

$N_2(s_1, s_2)$: Count of joint occurrences of the two symbols $s_1$ and $s_2$ contiguously.

Any handwritten word $W$ can be considered to be a first-order Markov process, where any symbol depends only on the previous symbol. Joint symbol (bigram) probabilities can be obtained as,

$$P(s_i|s_{i-1}) = \frac{N_2(s_{i-1}, s_i)}{N_1(s_{i-1})}$$

Probabilities of a symbol being at the start or end of a word are obtained as,

$$P_b(s_i) = \frac{N_2(b, s_i)}{N_T}$$

$$P_e(s_i) = \frac{N_2(s_i, b)}{N_T}$$

where $b$ denotes ‘space’. In order to effectively use bigram models, we consider the 3 class labels with the topmost SVM recognition scores for every symbol in the given word $X$. Let $W$ represent the set of all possible words. The most likely symbol sequence $W^*$ to represent the unknown word is obtained as that which maximizes $P(W|X)$.

Using Bayes’ rule we get,

$$W^* = \arg\max\{P(X|W)P(W) | P(X)\}$$

where, $P(X|W) = \prod_{j=1}^{k} P(x^j|w_j)$ represents the likelihood of the handwritten word given by the SVM and $P(W)$ is obtained from bigram statistics previously computed. Neglecting $P(X)$, the equation can be rewritten in terms of logarithms as follows.

$$W^* = \arg\max\{\log P(X|W) + \log P(W)\}$$

The most likely sequence $W^*$ is obtained by backtracing the lowest cost path using the Viterbi algorithm.

**Lexicon based correction**

A lexicon is constructed by extracting all the unique words from the corpus of Tamil text. Total size of the lexicon is 2.4 lakh words, which is divided into several smaller lexicons, depending upon the number of symbols contained in each word.

In this postprocessing, the number of symbols $k$ in the input word is noted down, as reported by the attention-feedback module. Then the class label sequence of the input word is obtained using the main classifier. The lexicon $L_k$, containing all words with $k$ number of symbols, is loaded into the memory. Using Levenshtein distance metric, the distance $d_i$ between the recognized sequence of symbols and every word $W_{pi}$ in the lexicon is computed. If the distance to any entry in the lexicon is zero, it represents an exact match and the lexicon search is terminated. Otherwise, the minimum distance $d_m = \min(d_i)$ over all the entries of the lexicon $L_k$ is found out, and the corresponding lexicon word is taken as the recognized word.

**Verification**

In Tamil script, there are many pairs or sets of symbols that are visually similar, which are often confused by the main classifier. Some of these symbol sets are /mu/ and /zhu/; /na/ and /La/; /ni/ and /Li/; /ki/ and /chi/; /la/ and /va/. In order to disambiguate between these frequently confused sets, an expert classifier is trained on the discriminating features between the set of confused symbols we use a technique called reevaluation where. Every time the AFS module assigns a class label corresponding to any one of the confused pair symbols we use the expert classifier to decide its final class label. We have examined and chosen 6 possible confusion pairs in Tamil.
Results

To see the real potential of the bigram language models and lexicon on the recognition accuracy, 2000 words with quality labels B and C are taken. These are relatively badly written words, with unusual number of strokes, unexpected overlaps, etc. The raw symbol recognition accuracy is 75.4% and the word recognition accuracy is 34.9%. With bigram models, these numbers improve to 78.8% and 42.5%. The accuracies using the lexicon are 74.1% and 46.6%, respectively. It was analyzed that the limited improvement obtained by the use of lexicon is due to the fact that nearly 25% of the test words were not found in the 2.4 lakh vocabulary, due to the morphological richness of Tamil language. On the other hand, only by using verification of 5 confusion sets, the symbol and word recognition accuracies improved to 76.9% and 45.1%, respectively. A combination of bigram models, verification and lexicon based postprocessing could lead to a more significant improvement.
Neural Networks based Recognition of Unicode Characters for identification of handwritten scripts in applications

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Abstract - This paper discusses the concept of Neural Networks, character recognition and various technologies used for character recognition. The aim of this research on ‘Neural networks and Character recognition’ is to study different techniques used for character recognition and to list the differences between them. This enables us to learn about the novel algorithms and also the behaviour of the algorithms under various methods and circumstances. This highlights the inter-relation between them and also bring out the advantage of each technique with their area of specialization (how easy to use the specified technique for a specific requirement). This proposed paper will help in easily identifying one of the best suited Handwritten Character Recognition technique for any requirement (digitizing cheques, palm Scripts/manuscripts, extract data from old documents to name a few).

I. INTRODUCTION

One of the most important effects the field of Cognitive Science can have in the area of Computer Science is the development of technologies making tools more humanistic in nature. A relevant traditional and current existing field of natural interface research’s handwriting recognition technology. Evidenced by the fact of not currently using Tablet computers, accurate hand writing recognition is clearly a difficult problem to solve. For a system which needs to be considered as good and acceptable it must be extraordinarily sorting out the issues and providing solutions, at least to an approximated extent if not to an highly accurate and apt level. An analysis of user acceptance of handwriting technology performed by IBM showed that an accuracy rating under 97% was considered unacceptable by most users. In computer science world, AI a.k.a artificial intelligence attempts to give computers human abilities. Humans train computer to think artificially. One of the primary means by which computers are endowed with human like abilities is through the use of soft Computing Technologies, Artificial Intelligence, Mining based technologies, etc., one such broadly used is the neural network – human brain is the ultimate example for this. The human brain consists of a network of over a billion interconnected element called neurons. These are combinations of so many individual cell that processes small amounts of information and then activate other neurons to continue the process and simulate a network called neural network. Neurons - Biological neurons use pulses or spikes to encode information. Neurological research also shows that the biological neurons store information in the timing of spikes. Spiking neural networks belong to the third generation of neural networks and like their biological counterparts use spikes to represent information flow. The applications are used as spatiotemporal information in communication and computation similar to biological neurons. They use pulse coding for information processing. They are much faster than rate coding which implies some averaging mechanism, and is typical to represent information flow. This doesn’t mean though that the rate coding scheme is never used but it means that pulse coding is used whenever faster speed is desired. The neuron (the granular unit of the brain) is the basibuilding block of the neural network. A neuron is communication conduit that both accepts input and produces output. The neuron receives its input either from other neurons or the user program. Similarly the neuron sends its output to other neurons or the user program.

II NEURAL NETWORK RECOGNITION

This need for accuracy is so demanding. ANN is so strong that it has even caused millions of people to learn an entirely new way to write. It has also made way that was easier for computers to detect. Unistroke recognition algorithms, like the popular Graphiti used on Palm devices require the user to adapt instead of the device, essentially the antithesis of
natural interface design. The technology has proven to be very accurate: “Each character is written with a single stroke. This solves the character level segmentation problem that previously plagued handwriting recognition. The curve drawn between pen down and pen up events can be recognized in isolation. Unistroke recognition algorithms can be relatively simple because there is no need to decide which parts of the curve belong to which character or to wait for more strokes that belong to the same character as is often the case when we try to recognize conventional handwriting. There have been many studies in the past using spiking neuron models to solve different problems. They provided a biologically plausible learning algorithm for realizing RBFs (Radial Basis Functions), which themselves are quite powerful in function approximation, pattern classification etc. In this study, spiking neurons were used to compute RBFs by storing information in their delays. The time difference between the pre and the post synaptic spikes was used to learn these delays. Neural networks use a set of processing elements (or nodes) analogous to neurons in the brain. These processing elements are interconnected in a network that can then identify patterns in data once it is exposed to the data, i.e. the network learns from experience just as people do. This distinguishes neural networks from traditional computing programs, which simply follow instructions in a fixed sequential order. There are many types of neural networks. One famous concept isotones neural network, a two-level network. In this concept, all images are down sampled before being used, which prevent the neural network from being confused by size and position. To develop a handwriting recognition system that is both as reliable as Unistroke, and natural enough to be comfortable, the system must be highly adaptable. Creating software that is as adaptable as its users are unique is a very challenging problem for conventional computer algorithms. This is why many people in the field of handwriting recognition are turning to neural networks to perform the recognition processing. Adaptable by their very nature, neural networks can bring to the computing world software that molds and conforms in ways algorithms like Unistroke never could. To line up the neurons with their recognized letters, each letter image in the network will be trained and fed into the network and the winning neuron is determined. The output neuron with the largest output value is considered the winner. For example, if you were to feed the training image for "J" into the neural network and the winning neuron were neuron #4, we will know that it is the one that had learned to recognize J’s pattern. This is done by getting an array of characters. The index of each array element corresponds to the neuron number that recognizes that character.

III. HANDWRITTEN CHARACTER RECOGNITION

Handwritten character recognition is one of the popular fields of research in pattern recognition. The need of handwritten character recognition is to digitize the manual written documents from hard copies of old documents like manuscripts, palm scripts and important age-old documents (bonds and registers maintained for long time) . Some of the classical examples of handwritten character recognition usage are: 1) Recognize signatures from cheques and match them with specimen copy to identify validity 2) Recognize data from cheques and interpret them for transactions 3) Digitize old manuscripts and palm scripts (earlier palm scripts were stored in digital films and rolls from which manually we interpret the content of the scripts) . With this technology, we can digitize the content at the same time interpret the content during extraction and recognition. The process of handwriting recognition involves extraction of some defined characteristics called features to classify an unknown handwritten character into one of the known classes. A typical handwriting recognition system consists of several steps, namely: pre-processing, segmentation, feature extraction, and classification. Several types of decision methods, including statistical methods, neural networks, structural matching (on trees, chains, etc.) and stochastic processing (Markov chains, etc.) have been used along with different types of features. Many recent approaches mix several of these techniques together in order to obtain improved reliability, despite wide variation in handwriting.

A The Hopfield neural network

The Hopfield neural network is perhaps the simplest of neural networks. The Hopfield neural network is a fully connected single layer auto-associative network. This means it has one single layer, with each neuron connected to every other neuron. Consider an example program that creates the Hopfield network with four neurons. This is a network that is small enough that it can be easily understood, yet can recognize a few patterns.
**Fig. 1: Neuron example for Hopfield neural Network**

<table>
<thead>
<tr>
<th>Neuron</th>
<th>Neuron 1 (N1)</th>
<th>Neuron 2 (N2)</th>
<th>Neuron 3 (N3)</th>
<th>Neuron 4 (N4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuron 1 (N1)</td>
<td>(N/A)</td>
<td>N2- &gt;N1</td>
<td>N3- &gt;N1</td>
<td>N4- &gt;N1</td>
</tr>
<tr>
<td>Neuron 2 (N2)</td>
<td>N1- &gt;N2</td>
<td>(N/A)</td>
<td>N3- &gt;N2</td>
<td>N4- &gt;N2</td>
</tr>
<tr>
<td>Neuron 3 (N3)</td>
<td>N1- &gt;N3</td>
<td>N2- &gt;N3</td>
<td>(N/A)</td>
<td>N4- &gt;N3</td>
</tr>
<tr>
<td>Neuron 4 (N4)</td>
<td>N1- &gt;N4</td>
<td>N2- &gt;N4</td>
<td>N3- &gt;N4</td>
<td>(N/A)</td>
</tr>
</tbody>
</table>

**Table – 1 Connection on a Hopfield Neural Network**

A Hopfield neural network has every Neuron connected to every other neuron. This means that in a four Neuron network there are a total of four squared or 16 connections. However, 16 connections assume that every neuron is connected to itself as well. This is not the case in a Hopfield neural network, so the actual number of connections is 12.

**B) How the Neural Network Learns**

Learning is the processes of selecting a neuron weight matrix that will correctly recognize input patterns. A Kohonen neural network learns by constantly evaluating and optimizing a weight matrix. To do this, a starting weight matrix must be determined. This matrix is chosen by selecting random numbers. Of course, this is a terrible choice for a weight matrix, but it gives a strain point to optimize from. Once the initial random weight matrix is created, the training can begin. First the weight matrix is evaluated to determine what its current error level is. This error is determined by how well the training input (the letters that is created by user in training the network) maps to the output neurons. The error is calculated during this process. If the error level is low, say below 10%, then the process is complete. Once a neural network has been trained it must be evaluated to see if it is ready for actual use. This final step is important so that it can be determined if additional training is required. To correctly validate a neural network validation data must be set aside that is completely separate from the training data. Neural networks can be applied to different application like Pattern Recognition and Auto-association. These two areas are explained below. Though this article concentrates more on Neural network application in Java, a brief introduction on Pattern Recognition will be helpful in understanding Neural Network application and Hopfield networks. Pattern Recognition Pattern recognition is one of the most common uses for neural networks. Pattern recognition is simply the ability to recognize pattern. The pattern must be recognized even when that pattern is distorted in a way. Pattern recognition in human life is used in many ways practically. A driver driving a vehicle should be able to accurately identify a traffic light. This is an extremely critical pattern recognition procedure carried out by countless drivers every day. But not every traffic light looks the same. Even the same traffic light can be altered depending on the time of day or the season. In addition, many variations of the traffic light exist. This is not a hard task...
for a human driver. Hard task would be to write a computer program that accepts an image and tells you if it is a traffic light? This would be a very complex task.

![Fig. 2: A Hopfield neural network with](image)

**IV PRE – PROCESSING AND SEGMENTATION**

The implementation process involved the use of a plain A4 sized paper to collect sample handwriting. A single document typically includes 10 lines with 3-4 words in each line. The documents are scanned at a resolution of 100 dpi and binarized using an adaptive thresholding technique. The image was then segmented into constituent text lines using the horizontal projection profile. For each line of text, four reference lines are extracted namely: upper line, upper baseline, lower baseline and lower line. These four lines determine three zones namely: the upper, core and lower zones. Zero values in the projection profile correspond to horizontal gaps between lines. The maximum and minimum zero value positions adjoining a text line are taken as the line boundaries corresponding to the lower line and upper line respectively. The upper baseline and lower baseline are identified using the first derivative of the horizontal projection profile. The local extreme of the first derivative in the two halves of the text line image are assumed to correspond to the two baselines. In some text lines, the upper or lower zones do not contain any character, in which case, the direct application of the above method may fail. Therefore, some heuristic rules were included in the segmentation procedure to handle such situations. To simplify the process of reference line extraction, a pre-formatted paper is used to collect handwriting, which contained all four reference lines on it. However, these lines are completely eliminated during the binarization of the image and have no effect on the segmentation. After the reference lines have been found, the individual words and characters are extracted using the vertical projection profile of each text line. Once the characters are segmented, the minimum bounding box of each character was identified eliminating the white space around it. Upper and lower boundary values of the minimum bounding box relative to the character line are sending to the next stage for preliminary classification.

**VI INTERMEDIATE CONVERSION**

There are some intermediate conversion types processed in order to obtain a processed Unicode format image.

**VI CLASSIFICATION RESULTS**
Neural Networks are one of the most commonly used systems in Artificial Intelligence. Neural Networks are particularly adept at recognizing patterns. This allows them to recognize something even when distorted. A Neural Network may have input, output and hidden layers. The input and output layers are the only required layers. The input and output layer may be the same neurons. Neural networks are typically presented input patterns that will produce some output pattern. If a Neural Network mimics the input pattern it was presented with, then that network is said to be auto associative. For example, if a neural network were presented with the pattern “0110” and the output were also “0110”, then that network would be said to be auto associative. A neural network calculates its output based in the input pattern and the neural network’s internal connection weight matrix. The values for these connection weights will determine the output from the neural network, based upon input pattern. The outputs in the above Fig. 1 and Fig. 2 gives brief details about the experimentation results concluded so far.

VII. REFERENCES

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TAMIL PUBLISHING FOR MOBILE PLATFORMS - TOOLS & UTILITIES

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Context

Given the rapid pace of Mobile Platform proliferation and they being part of people’s life for vast majority of People non-English, but conversant in the regional language - like Tamil. For effective reach of content and to unleash the potential of technology for masses: say Basic Mobile Phone to Smart Phones to Tablets – Android, iOS for iPAD, …, it is of utmost importance that content rendered on the device is in regional language - like Tamil.

The Need

Let me start with the below Note:

India Country Growth Manager of Facebook, Mr. Kevin D’Souza has been reported to have said it as:

“With over 50 million people in India on Facebook, we want to make sure that everyone has a great Facebook mobile experience regardless of the device that they choose to use, The launch of ‘Facebook for every phone’ mobile application in Tamil, Hindi and the other regional languages enables more people to connect and share anytime and anywhere,”

- Classic testimony for the need mobile content in Tamil!

This clever strategy intends to attract more consumers in the Indian Market, providing a better growth rate of the Mobile Internet, as well as targeting the potential users of regional Languages including Tamil. And this is only scratching the surface; Tamil based mobile content right from phone menu as soon as it boots up to reading and communicating in Tamil to Power off message in Tamil – will be order of the day.

Challenge

Tamil Language character-set has universally adopted Unicode representation in Computers - yet how far!

For a moment let’s look back at Tamil Language support in Computers in widely used Operating systems - the first Windows OS dates back to 1985 and only by the version Windows 2000 was one of the earliest OS to support Indic Languages including Tamil – still never supported Complex Script rendering using Unicode, until the very recent Windows 8. While Linux as well had its lag in Tamil Language Support.

Critical factor of Tamil language content access is the Native operating system support – and above data shows the lengthy time period taken for Tamil content access in Computers, which has a much mature eco-system from developer point of view and realization by the operating system vendors.

Whereas, Mobile Phone platforms has a very diverse operating system by plethora of vendors ranging from basic Java Mobile OS [J2ME], Feature phones with proprietary OS, Symbian OS, BlackBerry OS, Bada OS, …list goes on up until reasonably mature Mobile OS for Phones/Tablets such as Android and iOS – most of them evolving with new releases quite rapidly. Imagine they prioritizing Tamil Language Native Mobile OS support in the scheme of things - a true Challenge and a significant Gap indeed!
And then the eco system of Mobile App developers, Services targeting regional content, Government communication, Leisure content like magazines, Books and ocean of content in Tamil to be made mobile-ready and being made available to readers Globally - is a Long Haul indeed.

Scenario

In the context of regional language support Mobile Web Initiative in India conference was held in March, 2012 - organized by W3C India & IAMAI as well articulated by Mr.Venkatarangan, Former Chairman of INFITT:

Most of the time the Device OEM’s Engineering & Head Office (say in US, Europe, Japan or Taiwan) is ready to do Indian Languages (when they do tens of languages worldwide this is routine to them), it is the Indian Marketing & Operations office that throws the spanner. They sit in their glass offices in Gurgaon & Bangalore and think everyone in India follow English including Drivers, Maids, Cooks, Factory workers, ... By doing this they are not only killing our languages (but most of Indian Languages are classical languages surviving over thousands of years of external invasion), but also depriving the productivity & economic advantage that better communication through Mobile enables for common man.

This is the scheme of things. Yet, before few years, from a quiet corner of Vellore, bunch of Tamil Folks armed with Technology & Expertise and Passion to enable regional language Tamil content ubiquitously onto the mobile platforms, found a wayout !

Pioneering Effort of Tamil Rendering in Mobile Platforms

Why wait for a Global device vendor to enable Tamil on mobiles in the scheme of their priorities - realizing this ; As early as year 2007 Team at MobileVeda took up this mission and very first project was to render Thirukkurral in Mobile Phones based on J2ME OS which was the key mobile platform those days. It was not attempted before and no precedent to follow in the Mobile spectrum - No forums or Developer support from the device vendors or mobile OS J2ME community - as App Dev community thriving today, yet MobileVeda managed to fill the Pieces of this puzzle block - by - block for of Native Tamil Language rendering on mobile platforms, such as:

- **Design of each Tamil Character rendering:** Programmers finding all chars and combinations for each language
- **Font Designing** by graphic designers
- **Validation with Linguistic Experts**
- **Seamless UI design** for display resolution vs. Mobile Phone Screen Size
- **Mobile API Development** suitable to variety of Mobile OS
- **Readability controls** of rendered content
- **Developing Library as Font Tool so that not just us, Tamil Content and Mobile App eco-system can take advantage of.**
- **Due Academic review** [ at VIT University, Tamil Nadu

Content rendered using MV Font for Tamil Version 1.0 on 25-Jun-2007

This penchant of Tamil Publishing was a key driver of the project roadmap in MobileVeda – that has led to seamless content rendering across Mobile Platforms – Gadgets like: Phones, Tablets, Portable Devices powered by Android and -
Mobile OS: from basic J2ME Java phones, Symbian, BlackBerry …all the way upto iOS and Android through an ambitious initiative targeted at Tamil Content - Books, Magazines and other format of publishers – saying

Why just PUBLISH is pass get ready to FUBLISH - A Futuristic Publishing Platform

and

MV Tamil SMS Utility – An easy to use mobile messaging framework.

Tamil Publishing - Tools and Utilities

By virtue of continued innovation and sustained efforts, Tamil Language content rendering across mobile platforms is a reality today, through our Tools & utilities such as:

[1]. **Fublish – Tamil Content Mobile Publishing Platform**: Very simple mobile publishing platform: all it needs is content wide variety of supported file formats like ePub, PDF, … – Which will be readily available to be uploaded via simple web interface and FUBLISH seamlessly delivers to cross-platform reader mobile Apps and includes sales & payment collection. Content Publishers in the following sectors can exploit its potential:

1. Build magazines in your native language.
2. Book Reading application.
4. Create an application for News Reader.
5. Product catalog for Mobiles.
6. Build SMS based applications to receive SMS in your preferred Indian languages


[2]. **MV Font Library for Tamil**: Using the Application Programming Interface [API], Tamil Language content in mobile application with zero coding and content developers can package contents seamlessly without worrying about the native language support in mobile. Based on Unicode Tamil Character set rendering, This API seamlessly enables rendering of wealth of content in Tamil effortlessly: adapting content to various screen sizes of Mobile Phones. API is available for J2ME, BlackBerry, Nokia - Samsung Phones and works in most Java phones irrespective of the Vendors. [Ref: Click on Supported Devices List]

[3]. **MV Tamil SMS Utility**: Messaging is a basic use-case of a Mobile Phone and when done in Tamil to the near & dears to Government 2 Citizen communication to Marketing & Service messages by Business houses, … will be that much more effective. This utility powers such possibility.

Conclusion

Essentially, Tools & Utilities presented in this Paper enables all possible avenues of Tamil Publishing avenues across Mobile Platforms seamlessly & enables Content and App Developers ecosystem. MobileVeda invites Tamil Fraternity across the Globe to take advantage of the tools and disseminate / consume in TAMIL way.
Popular Tamil Publications such as Ananda Vikatan, Nakeeran, Rajesh Kumar Novels, ... are powered by FUBLISH
நிலை நிலைப்பற்றிகளின் மக்கள் பாரம்பரியம்

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அகாலிங்கம்

2009

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அவ்தரிணா நூறு ரீதியாரம்

குறிப்பிட்டு செய்யும் இன்றை தலைக்குறியாக நான் கூறுவதற்கு முந்தையான நூற்றாண்டுகளுக்கு முப்பது மூன்று வருடங்களை கொண்டுள்ளது நூறு ரீதியாரம். அவ்தரிணா நூறு ரீதியாரம் வாழ்ந்து விளையாடும் போது இந்த ரீதியாரம் அவ்தரிணா நூறு ரீதியாரம் வாழ்ந்து விளையாடும் போது இந்த ரீதியாரம்.

பார்த்தல் உடன் இன்றை தலைக்குறியாக நான் கூறுவதற்கு முந்தையான நூற்றாண்டுகளுக்கு முப்பது மூன்று வருடங்களை கொண்டுள்ளது நூறு ரீதியாரம். அவ்தரிணா நூறு ரீதியாரம் வாழ்ந்து விளையாடும் போது இந்த ரீதியாரம் அவ்தரிணா நூறு ரீதியாரம் வாழ்ந்து விளையாடும் போது இந்த ரீதியாரம்.

பார்த்தல் உடன் இன்றை தலைக்குறியாக நான் கூறுவதற்கு முந்தையான நூற்றாண்டுகளுக்கு முப்பது மூன்று வருடங்களை கொண்டுள்ளது நூறு ரீதியாரம். அவ்தரிணா நூறு ரீதியாரம் வாழ்ந்து விளையாடும் போது இந்த ரீதியாரம் அவ்தரிணா நூறு ரீதியாரம் வாழ்ந்து விளையாடும் போது இந்த ரீதியாரம்.
நெற்கூற்றுகள், கலோனி பாதுகாப்பு கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு நெற்கூற்றுகள் கருவறை மாணவரின் குறிப்பிட்டு

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திற்ப தெரிப்பர் கருத்துக்கள் மூலம் நிறுவப்பட்டது

வேலையாளர் பதிக்காரர் அலுவலகம்

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பதிவுக்காக நிவாரணம், தமிழ் பொறியியல் முறுக்கத்திற்கு, கலாசாரா, திருச்சிக்கு நுழைந்து

தோற்ற சுருக்கத்தின் பதிவு.

காலனித்துவ பதிவு பதிவு கிறிக்கை தொடர்ந்து.

அத்தரு கலைப்பதிவு

தோர் கலைக்குள்ளை கருத்துக்கள் தமிழ் அலுவலகம் . வேலைக்குடன் தியானம காண்பாடை , குறுக்கும் பொருளியலில், உயிரியல் பல்லாகாலங்கள் தொடங்கும் குறுக்கும் படைப்படுத்தல் அலுவலகம் குறுக்கும் கருத்துக்கள் அறிவித்து. இதுபோன்ற கலைப்பதிவு முழுக்காக வல்லாம். அது வெளியுள்ள கலைக்குள்ளை நிறுவப்பட்டிருக்கும் அலுவலகம் . இது வெளியுள்ள கலைக்குள்ளை நிறுவப்பட்டிருக்கும் அலுவலகம் குறுக்கும் படைப்படுத்தல் வல்லாம். இது வெளியுள்ள கலைக்குள்ளை நிறுவப்பட்டிருக்கும் அலுவலகம் குறுக்கும் படைப்படுத்தல் வல்லாம். இது வெளியுள்ள கலைக்குள்ளை நிறுவப்பட்டிருக்கும் அலுவலகம் குறுக்கும் படைப்படுத்தல் வல்லாம்.

இந்தியா அணைமை அறிக்கையில் தரிசையும், குறுக்கு பாடல் ரோமசம் குறுக்கும் கலைக்குள்ளை குறுக்கும் வல்லாம். பொருள் என்று MS-Word, MS-Powerpoint, MS-Access, MS-Excel பொறியியல்

இழைக்குறி கூறியும் போன்றது வல்லாம். இது என்று அறிவியல் அறியும் அறிவியல் அறியும் அறிவியல்

தோர் கலைப்பதிவு

SQL குறுக்கு குறுக்கு ல் செய்ய நோய் செய்யியிருக்கிறது இன்னும் தொடர்ந்து , கருத்துக்கை இருப்பிடி தொடங்கும் குறுக்குக்கு குறுக்கும் படைமுறை படை வல்லாம். இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படைமுறை

தோர் கலைப்பதிவு

தோர் கலைப்பதிவு பாதுகாப்பானது குறுக்கும் படையில் குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படைமுறை

சுருக்க நூற்றாண்டு நூற்றாண்டு

தோர் கலைப்பதிவு குறுக்கும் படையில் குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படைப்படுத்துகிறது.

சுருக்க நூற்றாண்டு நூற்றாண்டு

தோர் கலைப்பதிவு குறுக்கும் படையில் குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது. இது என்று பொருள் நேர்வாயுக்கு இருக்கிறது , பொருள் வைத்து வைத்து வருகிறது படைமுறை குறுக்கும் படையில் குறுக்கும் படைப்படுத்துகிறது.
Table in Database

\[
\begin{array}{|c|c|}
\hline
\text{Column} & \text{Value} \\
\hline
\text{Column 1} & 50 \\
\text{Column 2} & 20 \\
\text{Column 3} & 60 \\
\text{Column 4} & 60 \\
\end{array}
\]

// Create Database Gandhi-nehru

// Select Statement

// Update Statement

// Insert Statement

// Delete Statement

//create procedure –people name listing

// Open HR db

// when not empty

// check the table one record at a time
GENERAL ARCHITECTURE OF TAMIL SQL THROUGH MYSQL WITH TAMIL OUTPUT

**Process Flow:**

1. **SQL IN TAMIL**
2. **MYSQL TRANSLATE ENGINE**
3. **SQL IN ENGLISH EXECUTED AT BACK END**
4. **OUTPUT TRANSLATION ENGINE**
5. **OUTPUT OF SQL QUERY IN TAMIL**

**Description:**

1. **SQL IN TAMIL**: The input is in Tamil SQL, which is a dialect of Tamil with SQL syntax.
2. **MYSQL TRANSLATE ENGINE**: This engine translates the Tamil SQL into English SQL as per the specifications.
3. **SQL IN ENGLISH EXECUTED AT BACK END**: The English SQL is executed in the MySQL database backend system.
4. **OUTPUT TRANSLATION ENGINE**: This engine translates the English output back into Tamil SQL or facilitates the output as per the requirements.
5. **OUTPUT OF SQL QUERY IN TAMIL**: The final output is in Tamil, fulfilling the need to communicate in Tamil.

This architecture ensures seamless translation and execution of Tamil SQL queries in MySQL, maintaining the integrity of Tamil language throughout the process.
Topic C
Corpora
தரவுக்கள்
An Introduction to Thamizh Informatics and Thamizh Literature Intelligence

Naga Elangovan

This paper introduces Thamizh Informatics as a branch of computing for the benefits of Information Management of Thamizh Language Records. It emphasizes the need for maintaining clean, integrated and preserved Thamizh data to obtain valuable information through systematic development of Thamizh Informatics. In order to accelerate the growth of Thamizh-IT as a whole, this paper proposes a reference framework for development of Thamizh-IT, and places Thamizh Informatics within it and describes the same. Overall, this paper discusses a framework for the development of Thamizh-IT, Thamizh Informatics and System of Records, and Thamizh Literature Intelligence application.

A Reference framework for Thamizh-IT

Global growth of “using” Information Technology (IT) has been exponential year-on-year. If growth of Thamizh Information Technology also has to occur, it largely depends upon adhering to the global industry model of working. The current practiced model of “Sporadic Thamizh Computing Initiatives” does not help in rapid and systematic growth. The present approach lacks constructive framework, functional model and engineering. In fact, there is no market, systematic application of software development, and long term identification of needs. Therefore, it mandates a definite reengineering, if Thamizh Computing (TC) is intended to create an industry and market for the same. Hence this reference framework is now proposed and described.

Centers of Excellence (COE): IT/Computing has scores of branches globally. Some of them are applicable and important as well for the foundation of the Thamizh-IT Industry. Currently, the term Thamizh Computing (TC) is very loosely used for all Thamizh-IT initiatives, be it Unicode character standards, font creation, arbitrary data record creation, websites creation, video/audio data creation etc. Anything Tamil to do with computers is called TC. Such an approach is too general and lacks precision. TC initiatives need to be more specific and branch wise so that a systematic focus is applied for the
growth. The foundation branches of Thamizh-IT can broadly be classified into four viz. Technology, Informatics, Community services, Office ware & Fundamentals.

*Technology Software* refers to the research & development of “solutions” like OCR, Speech Recognition, grammar technology etc. *Thamizh Informatics* deals with turning a vast amount of Thamizh data into useful information. Integration of literature, archaeology, manuscript and research data, Image and document data management are some of the areas within Informatics. *Community Services* refers to all the online interactions with people like eGovernance, Thamizh call centres etc. *Office ware and Fundamentals* is another vast area within the Thamizh-IT development framework dealing with Office and Publishing software, Fonts etc.

COE will focus on developing various solutions to all the above needs, assembling appropriate vendors and resources. 4 COE can be owned by 4 different sets of Government or Academic Institutions that participate in Funding and Governance support. COE for software development on these branches individually will enable a rapid development of Thamizh-IT Industry and Market. These branches will grow each other sharing the benefits of each other. These branches being core of TC, it becomes essential to pay focused attention in terms of governance, policies and support in order to serve the needs of TN over a very long time.

*Thamizh Software Architecture & Standards Organization (TS-ASO):* When focusing on creating an industry and market for Thamizh-IT, efficient planning is imperative. It requires an office to establish decision making principles and standards. It will integrate technology practices and standards across various branches of TC. Also it will identify issues and conflicts, and provide possible resolutions. It will interact and coordinate with world institutions and bring the best practices, guidelines and standards to Thamizh-IT industry.

*Thamizh Software Promotion Council (TS-PC):* While the TS-ASO supports TC with technology and engineering, Promotion Council supports TC with Market for Thamizh Software. TS-PC will work on identifying the areas requiring Computerization and Thamizhization solutions. It creates the market for Thamizh-IT. It understands the market issues and conflicts and strategizes the solutions. The advantage of positioning TS-PC within the framework is to earn revenue for the Government and other funding organizations. The funding support of the Government and other organizations can not go always as expenses. There should be returns for Thamizh-IT initiatives wherever possible. It will help the industry sustain and grow in a healthy way.

*Government and Institutional Support:* The whole Thamizh-IT initiative can only be successful if the government of Thamizh Nadu, in collaboration with various Academic and Research Institutions, fully supports Thamizh-IT by enabling the other components of the framework. GoTN may consider it as a potential revenue earning opportunity. Revenue opportunity can be shared by self and the other participating funding Institutions. GoTN support shall be in terms of Funding and Governance. Revenue driven Thamizh-IT development will offer more benefits than a non-revenue approach.

*Thamizh Informatics*

Informatics is a broad field within IT that deals with large amount of data, integration and processing to obtain useful information. The business industry world–wide has used it and benefited beyond imagination. Tens of social and technology fields also have used Informatics in a big way. In the context of Thamizh-IT, this branch of IT can be adapted to Thamizh Language computing where huge amount of data is available; and hence it will turn out to be a vast field of Thamizh Informatics.

Lots of Thamizh data are available in Literature, Archaeology, Manuscripts, Research Periodicals and Journals, and others. These data exist in different media/formats like stone, palm-leaves, paper, Picture, Digital, Multi-Media etc. Oldest data is reported to be dated 500 BC. Importantly these data exist in silos across multiple organizations like Universities, Libraries, Research Institutions, Private Organizations and individuals of TN and the world.

Be it business or language domain, every civilized country trusts that their data are assets. They use Informatics as a technological solution to Gather, Cleanse, Arrange, Integrate, Process, Analyse, Research and Use the data for meaningful information. More importantly preservation of data for a very long period of time is another attractive part of
Informatics. Thamizh Language domain as of today has every reason to migrate into an information system in an integrated way, and preserve the ancient evidences too. The status of Thamizh data can be summarized as under:

**Picture-2: Thamizh System of Records**

- Not captured on a common model
- Digital versions of literature are unreliable due to flood of mistakes
- No record of Inscriptions and Coins
- Research papers are not accessible
- Palm-leaves have lost their life and are decayed worst in various libraries. There is every chance of losing these evidences of ancient literature
- Any existing small digital records of Thamizh data are not accessible to all. They are mostly in silos and unused.
- Cross reference between any two Thamizh data is impossible
- Very few Dictionaries are seen on the net but ownership by Institutions of TN is very rare; an Integrated dictionary system is absent
- Tens of Dictionaries are yet to be digitized and no Word/Alphabet/Sign concordance system is available
- Thamizh Data Corpora is a continuing dream; and no systematic base for qualitative and quantitative analysis and research
- Thamizh texts and books are available a lot in the internet but no way an integration with the rest of Thamizh data is possible

It can be observed that there are unavailability and inconsistency issues in all the Thamizh related data and related initiatives. This means that “Thamizh System of Records” (SOR) is absent in Thamizh-IT world. Another important concern is that there is a general belief that publishing in the internet is the way of Thamizh growth. It is true to some extent but with the inconsistent and flawed versions of any Thamizh data is not of any help. There is a pressing need for SOR for Thamizh data. There is also a belief that Thamizh has grown a lot and is the most popular language in the internet after English. This is a very misplaced myth that can endanger the prospects of true Thamizh growth. The fact is that Thamizh is nowhere in the top ten languages of the Internet.
Picture-2 as above depicts the sources of Thamizh data, Thamizh System of Records, and possible uses of clean Thamizh Information System. It is very natural that any information system evolves from disparate sources of data and heterogeneous forms of existence. Hitherto, such data in the Thamizh context have been handled in individualistic way towards computerization/digitization. The results are proving that there is a need to adhere to proven industry standards and model of implementation. The following are some of the important tasks to be done to create a Thamizh Informatics System with proper SOR:

- Plan and Architect the Infrastructure (HW/SW). While cost effective database and software solutions are available, it should be taken into consideration that going for cheap solutions and free solutions will pose serious constraint over long time.
- Establish a common Meta Model for all Thamizh data
- Strategise Data gathering (or extraction or integration from source)
- Clean and Transform the source data
- Data Model the logical structures of the TSOR and design Physical Structure and Store the data
- Establish and Maintain Reference data and Meta data
- Integrate the various types of data like Literature, Inscriptions, Images etc
- Establish policies and processes to bring in external data from the National databases, World Language Informatics and Archaeological data sources.
- Build User Systems through internet that uses the data to build it’s information; and input the data it has gained from the world

It is important that the Technologists and Thamizh Subject matter experts work together on these tasks in an “Incremental and Iterative” model of development for the best results.

**Potential benefits of Thamizh Informatics:** Thamizh Informatics when implemented using Information Architecture, Standards, methodology and models, it will set up a golden platform for Thamizh development. Some of the pointers towards its potential uses are:

- Common, integrated, collaborative platform of Thamizh Information
- Collaboration enables the students, teachers, researches and community working together on a world class language platform
- Standard of research and research education will grow exponentially
- Community services like Call centres for every Thamizh need of people
- Create a world class real-time science and technology translation and vocabulary creation and help Thamizh based teaching in science and engineering studies
- Integrate with commerce, science, law fields to serve their Thamizh needs
- Perform world class quantitative and qualitative linguistics, literary and archaeological researches
- Develop large corpora, build Alphabet/Signs/Words Concordance system.
- Integrate tens of dictionaries of different fields
- Integrate with eGovernance for all Thamizhization requirements

**Thamizh Literature Intelligence**

Thamizh Literature Intelligence is the software application part of Thamizh Informatics. The software application enables Analysis and Research of Thamizh literature. It works on top of the Thamizh System of Records created as described earlier in this article. It enables deep insight into the Literature from quantitative and qualitative perspectives. Further, it allows working with other form of Thamizh data like Inscriptions, Coins, Palm-Leaves etc. for comparative studies. The software allows multi dimensional analysis and data mining for deep researches.

The author has developed a Literature Intelligence application with some features to demonstrate. It grows gradually. The software works on the SOR that contains 27 literature titles and few inscriptions as of now. ThirumurugAtruppadai, NedunalvAdai, Natrinai, Thirukural, Thirumurai 1 to 9, Prabandam 1 to 3 and Kalladam are added to the SOR as of now. Gathering of more literature and Inscriptions continues. This application enables graphical presentation of Frequency,
Distribution of letters, syllables, yAppu etc. for a given literature and across all literature. Some of the features that can be demonstrated are

- Frequency analysis of all Thamizh letters
- Frequency of vowels, consonants and composite letters
- Distribution of consonant categories
- Letter usage in literature – Highly used (top 10), Less used (low 10), unused letter analysis
- Author wise yAappu usage
- Data Mining – Inherent patterns of syllables across literature
- Concordance across literature and Inscriptions for given string of letters, syllables, words
- Pattern Analysis - It allows building various algorithms and investigate if there are any inherent patterns and similarity among poems

Using this platform the author is researching to find if a signature can be obtained for every literature and author. A few algorithms have been tried and the effort is gradually progressing. One of the advantage of this could be to find the differentiating factors between multi-author literature like Natrinai and single-author literature like Thirukural. It can also help identifying the possible insertions.

Due to article limitations, detailed discussion on various features can be a separate part. However, this application gives two messages. The first is that a disciplined and engineering way of setting up Thamizh System of Records can allow endless modern analysis and research on Thamizh data. It is required for Thamizh. The second message is that any Thamizh researcher and student can learn building Thamizh Informatics and Literature Intelligence if they follow the simple methodology of the author. They can participate in the initiatives of creating larger version of Thamizh Informatics as a more technical person.

Conclusion

All Thamizh data must be gathered under a defined Meta Model which does not exist today. Capturing them in bits and pieces all around will be waste of effort and money. Thamizh Informatics will place Thamizh on par with global language analysis status which is important for Thamizh to be competitive. Past evidences of all Thamizh data should be preserved on priority basis. Thamizh-IT development initiatives should classify Thamizh Computing and pay focused attention on the 4 foundation areas with the support of Technology and Market Promotion. Thamizh-IT development framework is essential for accelerated growth of Thamizh-IT industry and market. Spending on Thamizh-IT will yield if and only if it follows the standards and practices of the world that is very successful on its scientific approach.
தமிழ்மொழியில் சுருக்கக்கூறுகள் பரிபாளன்: நூற்றாண்டு முறையும்

முதல் பாகம்

முதலில் தொடர்பு பயன்பாடுகளின் மேல் படி பயன்படுத்தப்பட்ட இந்துக்கதாக்கம் நூற்றாண்டுகளுக்கு வரை இருந்திட்டுள்ள தமிழ்மொழியின் செயற்பாடுகள் பயன்படுத்தப்பட்டுள்ளன. அதுவரை பெரும்பாலான தமிழ்மொழியின் இருந்தவற்றில் அந்த பயன்பாடுகள் பயன்படுத்தப்பட்டிருந்தன. தமிழ் மொழியின் பெரும்பாலான பண்புகளை அளிப்பதற்கு தமிழ்மொழியின் பயன்பாடுகளில் உள்ள பெருமான்றான மூலைகளுக்கு அரைய்ப்பட்டுள்ளிருந்தது.

இப்போது பயன்பாடுகள் முதலில் சுருக்கக்கூறுகள் பகுதிகளாகத் தமிழ்மொழியின் செயற்பாடுகளை வட்டுமாறு வைக்கப்பட்டுள்ளன. தமிழ்மொழியின் சுருக்கக்கூறுகள் பகுதிகளை வட்டுமாறு வைக்கப்பட்டுள்ளது வெளியிலிருந்து பயன்படுத்தப்படுகின்றது. இவ்வாறான பகுதிகளை வட்டுமாறு வைக்கப்பட்டுள்ளது வெளியிலிருந்து பயன்படுத்தப்படுகின்றது.
தமிழ்

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174/33
(இன்றுவிளக்கம் காண, காண, காண தானூண்டல் மீண்டும், மீண்டும், மீண்டும்)

| கார் | எண் | எண் | எண் | எண் | எண் | எண் | எண் | எண் | எண் | எண் | எண் |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| கார் 6777 | 1325 | 1197 | 74  | 4639 | 379  | 1013 | 6967 | 706  | 871  | 414  | 0    |
| கார் 10 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| கார் 1453 | 239  | 959  | 104 | 279  | 110  | 1171 | 360  | 33   | 258  | 46   | 0    |
| கார் 60 | 56   | 4    | 0    | 0    | 0    | 0    | 59   | 0    | 0    | 0    | 0    |
| கார் 1312 | 298  | 758  | 16  | 1400 | 13   | 78   | 385  | 54   | 35   | 309  | 0    |
| கார் 1587 | 256  | 597  | 64  | 359  | 9    | 98   | 134  | 68   | 15   | 44   | 0    |
| கார் 7351 | 1126 | 1430 | 129 | 4233 | 141  | 707  | 953  | 225  | 379  | 602  | 0    |
| கார் 259 | 65   | 77   | 90  | 18   | 11   | 50   | 27   | 0    | 3    | 27   | 0    |
| கார் 7216 | 1008 | 1738 | 40  | 2160 | 342  | 1581 | 599  | 263  | 666  | 364  | 0    |
| கார் 1702 | 351  | 200  | 28  | 320  | 178  | 230  | 179  | 232  | 115  | 49   | 0    |
| கார் 196 | 290  | 55   | 1   | 193  | 2    | 42   | 63   | 9    | 9    | 47   | 0    |
| கார் 0 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| கார் 3661 | 1546 | 953  | 13  | 345  | 1    | 240  | 409  | 659  | 719  | 277  | 0    |
| கார் 576 | 140  | 127  | 3   | 55   | 25   | 24   | 48   | 40   | 1    | 1    | 0    |
| கார் 0 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| கார் 1502 | 253  | 669  | 9   | 291  | 35   | 68   | 43   | 143  | 8    | 10   | 0    |
| கார் 3186 | 652  | 945  | 11  | 1916 | 19   | 149  | 202  | 106  | 62   | 80   | 0    |
| கார் 3134 | 869  | 512  | 22  | 555  | 21   | 141  | 297  | 507  | 81   | 137  | 0    |

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(மா, >>>>>>>>> முடிவு,)

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</table>
தமிழ் நூல் பராமரிப் பிரிவுகள் எனும் பிரிவில் இந்தப் பாகம் பற்றியிருக்கிறது. ஆனால், இந்தப் பாகத்தில் பல சமுதாயம் கொண்டாள்வது. சமுதாயம் கொண்டாள்வது, என்று உங்கள் முதல் வாயிலில் கூறப்பட்டுள்ளது.
ஒற்றை, விளையாட்டுகள், பணமான, இருக்காத விளையாட்டுகள், மற்றும் இல்லாதியடைந்து விளையாட்டு. 

1. வேறுபட்டு பாதை (Search facility) பிரிவு விளக்கப்பட்டது.

2. மரபு செயல் (to get a grammatical category)

3. கூறல் அடையும் (Keyword in context)

4. விளையாட்டு (compare)

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5. மூலம் (graph)

துச் விளக்கம் அருகு சுற்றிமாற்றும் பொருள் அகமையாக போராடும் என்று வைக்கப்பட்டது.

மூலம் - தங்கள் ஒருவனின் பாதுகாப்பு பற்றிய பராமரிப்பின் அப்பயிற்சியின் கதியும் கிளைத்தொடர்

திறகு. பார்வாகம் இவரும் அப்பொருளின் பாதுகாப்பில் இருந்தது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது.

மூலம் - குறிப்பிட்டு கூறும் புனிதவாய்ப்பின் அப்பயிற்சியின் கதியும் கிளைத்தொடர்

திறகு. பார்வாகம் இவரும் அப்பொருளின் பாதுகாப்பில் இருந்தது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது. தீர்வு செய்யப்பட்டது.
டீடிவுமங்கின்றது இத்தரிக்கும் கொடுக்கலார். இந்த முக்கியமான போட்டியில் பிரிவு குறிப்பிட்டும் மாற்றங்களை கையேட்டு வலும்.

- பொருளகிட்டுதலாக்குவதற்கு, பொருளின் முறைக்குச் சிக்கும் பிரிவில் உறையும் விளக்கம் செய்யப்படும்.
- பொருளாயினரை பொருளாயினரின் கோட்டாரம் தெரிவுக்கும் பதிகரிவு செய்யப்படும்.
- உலக முனிவர்கள் பொருளாயினர் அறிவூட்டும், பொருளின் முறைகளை அகரவிய தொடர்பு வகைப்படுத்தப்படும்.
- குறுக்கம் வழியங்கள் காண எதிர்பார்க்கும் (mono-lingual), இரு பொருள்பாடுகள் (bi-lingual) மாற்றிகள் பதிகரியப்படும்.

- முனிவர்களுக்கும் இரவர் குறிப்பிட்டு NLP-க்கு வளர்ச்சிக் கோளில் மேற்கோள் கடன் மற்றும் தகவளிக் கோள் பதிகரியப்படும்.
நூற்றாண்டு (Corpus)

முன்னை காரணம்: பார்க்கிற தவறான வரலாற்றுத்தகவல்

பண்டாரீமாரால், புதுப்பிடித்து எழுதிய பக்தக்குறிப்பில், வல்லூர் பல்கலைக்கழகம்
pann1973@gmail.com

அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர்.

நூற்றாண்டு பல்கலைக்கழகத்தின் பத்தாண்டு பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர். அதன்றி நூற்றாண்டு பார்க்கும் பல்கலைக்கழகம் எந்தவாறு தவறான வரலாற்றுத்தகவல் பயன்படுத்தி என்று பலர் கேள்விக்படுத்துகின்றனர்.

1. கல்லூரி, புதுக்கோட்டை, விள்ளாடி, பொன்னூர், தென்னை மாவட்டம், என்னும் பக்தான் பல்கலைக்கழகம்
2. பத்மாவளி பக்தக் குலம், பாங்குகலம், பட்டுவாடி குலம்.
3. பாங்குகலம், திருப்போவில் பாங்குகலம்.
4. பாங்குகலம், பாங்குகலம் பாங்குகலம், பாங்குகலம்.
5. பாங்குகலம், பாங்குகலம் பாங்குகலம்.
6. பாங்குகலம், பாங்குகலம் பாங்குகலம், பாங்குகலம், பாங்குகலம்.

இந்த பக்தக் குலம் பல்கலைக்கழகத்தின் இரண்டாம் பக்தக் குலம் என்று குறிப்பிடப்பட்டுள்ளது. தவறான துறை பக்தக் குலம் பல்கலைக்கழகம் என்று குறிப்பிடப்பட்டுள்ளது. தவறான துறை பக்தக் குலம் பல்கலைக்கழகம் என்று குறிப்பிடப்பட்டுள்ளது. தவறான துறை பக்தக் குலம் பல்கலைக்கழகம் என்று குறிப்பிடப்பட்டுள்ளது.
தமிழகம் ஒன்றியத் தொகுப்புகள்

குறிப்பிட்டு தமிழகம் ஒன்றியத் தொகுப்புகள் என்பது தமிழகத்தின் முழு தொடர்பின் முக்கியமான தொகுப்புகள் என கருதப்படுகின்றது. இச்சொரு தொகுப்புகள் தமிழகச் சான்றான மூன்று பகுதிகளாகவும் விளக்கப்படுகின்றன. இது தமிழக மொழியின் ஒழுங்கம் மற்றும் காண்கூற்று வடிவங்களின் வளர்ச்சியை எந்தவாறு எடுத்துநிறுத்தும் பொருளுள்ளது. இது தமிழகம் ஒன்றியத் தொகுப்புகள் என்று அழைக்கப்படுகிறது. (Tamil Heritage Foundation) என்ற பெயராலான இது தமிழகத்தின் பாதுகாப்பு பொருளாதார வடிவங்களின் மூலம் முழு தமிழகமும் ஒன்றியத் தொகுப்புகள் என்று அழைக்கப்படுகிறது.

 korpus linguistics என்ற பெயரில் இச்சொரு தொகுப்புகள் என்று கருதப்படுகின்றது. இது தமிழக மொழியின் வளர்ச்சியை எந்தவாறு எடுத்துநிறுத்தும் பொருளுள்ளது.
Machine Readable

Jan Svartik

British National Corpus

Francis

Lund Corpus

Linguistic Performance

20

200

Oslo

Quirk:1960

Brown Corpus

Brown Corpus

London-Lund Corpus
1993 - Eric Pederson (Eric Pederson) founded corpus management as a research area to address the need for large corpora in Indian languages. Pederson played a key role in developing tools and techniques for corpus management. His work laid the foundation for modern corpus management in Indian languages.

"Corpus development is an area where we need to focus more on," said Pederson. "And we need to bring together expertise from different fields - linguistics, computer science, and technology."

www.crea.in, corpus.html

2016 - The Tokyo University Concorance (TUC) project was initiated to address the need for large corpora in Indian languages. The project aimed to develop tools and techniques for corpus management.

www.cict.in
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வணக்கம் போன்ற தொன்றை கைமுதலுள்ளன. வரும் காட்சியால் இந்த கல்வி அடிப்படையாக வருகின்றது. வருகின்ற கல்வியால் தம் விளக்கமும் வெளிப்படையாக வரும். பலரும் தம் கல்வியை வேண்டும் பாடல் கையேடுகளிடையே அளிக்கும் கோள் பற்றிய தலை. அறிவு, கல்வி, பெண்கள், பெண்கள், பெண்கள் உடேர்ந்து இந்த கல்வியை வேண்டும் குறிப்பிட்டது. இந்தக் கல்வியை வேண்டும் என்று சொல்பாற்றும் வரும் காட்சியால் வேண்டும் குறிப்பிட்டது. இந்தக் கல்வியை வேண்டும் என்று சொல்பாற்றும் வரும் காட்சியால் வேண்டும் குறிப்பிட்டது. பலரும் தம் கல்வியை வேண்டும் பாடல் கையேடுகளிடையே அளிக்கும் கோள் பற்றிய தலை.
Aim

The goal of the Natural Language Processing (NLP) is to build Computer software that will analyze, understand and generate natural language like a human. There are two ways in which we can build software 1) Rule based modeling of the natural language 2) Corpus based modeling of the natural language. In rule based modeling of the natural language, the natural language information is to be given in the form of rules (Phonotactic, Morphotactic and Syntactic rules). In corpus based modeling of the natural language, the algorithm itself derives the rules from the annotated corpora (electronically stored tagged linguistic data). The present paper discusses the issues while developing annotated corpora at word level for the Modern Tamil.

Annotated Corpora

Annotated corpora means the electronically stored text or speech data can be marked or assigned with some notations or tags in such a way that a machine can understand the text or speech data. The marking may be at different levels of a language i.e Phonological, Morphological, Syntactic, semantic and Pragmatic levels.

Annotated corpora at word level

Each word has their own class and parts of speech (POS) tagging are simply the problem of placing words into equivalence classes. Garside (1995) says POS tags to each word is passed through the stages of morphological analysis and grammatical interpretation. Generally, specially designed codes carrying grammatical information are assigned to the words to indicate their part-of-speech with regard to their use in the text (Leech and Garside 1982). In most cases, a well-defined set of linguistic rules are used to identify and assign POS tags to words to determine their lexico-semantic entities and syntactico-grammatical functions in the text.

Uses of POS tagging:

POS tagged corpus is a valuable resource for the works of Natural Language Processing, Language Technology and Machine Learning

It is useful for describing a language.

It is very useful for testing a new linguistic hypothesis.

At lexical level it allows to analyse the morphological structure of words represented in their surface forms.

At orthographic level it draws distinction among the homographic forms used in the same text or similar other texts to make distinctions in their semantic roles, and

At syntactic level it allows to identify syntactico-grammatical functions of words.

Procedure for doing POS tagging

In general, the process of POS tagging may be carried out on a piece of text at three separate stages as the followings

(a) Stage 1: Manual or automatic pre-editing of text,

(b) Stage 2: Manual or automatic tag assignment to words, and
Stage 1: Corpus usually contains some extra symbols, spelling mistakes, some missing words and sentences etc this should be cleared. Tokenize the corpus properly by separating punctuations from preceding tokens and by splitting sentences or phrases into their constituent tokens.

Stage 2: In this stage, only one tag should be assigned to each word based on their syntactic and grammatical function of the word in the sentence.

Stage 3: At this stage the entire tagged text database is manually post edited to verify if words are properly tagged.

Tagset

Tagset are names given to a set of tags from which tags are to be given to the input words in a text. The tagset consists of grammatical tags, which may include the morphological, morpho-syntactic, semantic, and discourse level of tags.

There are different types of tagsets are available 1) Flat tagset 2) Hierachical tagset 3) BIS tagset. Following is the list of tagsets used for the Tamil language:

- Ganesan’s POS tagset, Annamalai University,
- Amrita POS Tagset. Coimbatore,
- AUKBC tagset, Anna University,
- Kongu Engineering College POS Tagset, Erode
- Rajendran’s ILMT-Tagset, Tamil University,
- Vasu Ranganathan’s Tamil Tagset
- kathambam of RCIILTS-Tamil tagset
- LDC-IL-Tamil hierarchical tagset CIIL, Mysore,
- IIIT-Hyderabad tagset
- Microsoft research labs-bagalore tagset

The present paper identified the problem in POS tagging based on the following 14 tagsets developed by CIIL Mysore:

1. Pronoun (P)
2. Demonstrative (D)
3. Noun (N)
4. Nominal Modifier (J)
5. Verb (V)
6. Adverb (A)
7. Participle (L)
8. Postposition (PP)
9. Particle (C)
10. Numeral (NUM)
11. Reduplication (RDP)
12. Residual (RD)
13. Unknown (UNK)
14. Punctuation (PU)

Issues in POS tagging

The issue of assigning part-of-speech to words, although appears to be simple, straightforward and one dimensional, is in fact, embedded with several theoretical and technical complexities with regard to identification of actual lexico-semantic entities as well as syntactico-grammatical functions of words used within a piece of text.
1) In Modern Tamil, the word ‘enRu’ occurs in the following way. So based on the syntactic of the sentence we have to assign POS tags for the words.

1. wh-adjective
   
   Example: enta naaLil nii vantaai “in which day you came”

2. Adverb
   
   Example: tollai enRu tiirum? ‘when will this problem solve’

3. Conjunction
   a. Quatative
       
       Example: avan naaLai varuvan enRu connaan ‘He said that he will come tomorrow’.
   b. Called
       
       Raman enRu oru aaL irukiRaara? ‘a person called raman is here? ’
   c. Purposive
       
       The subordinate verb end with a future tense marker
       
       Example:
       
       naan paNattai ungaLukku koTukkaalam enRu ninaitteen ‘I thought I can give the money to you ‘
   d. Onomatpoeic
       
       Example: avan kutu kutu ena ooTinaan ‘He rans quickly quickly’
   e. Giving focus
       
       naan unakk enRu vaangiya peena? ‘I brought the pen for you only’

2) Tamil has adverbial suffix which is responsible to make any word into adverb example cuttamaaka (cleanly), cukamaaka (happily), nicaimaaka (surely) amaitiyaaka (silently) but there are other cases in Tamil where this adverbial marker ‘aga’ can come with the Proper noun avan raamanaka vantaan (he came as Lord Rama). If we tag it as adverb the important information like proper noun will be missed out in POS tagging.

3) Compound

   whether all the compound words should be written as one word or two separate is a problem. V.I.Subramaniam quote as follows for compounds in a texts “In some places segmentation of the head word was problematic”. The principles of segmentation adopted are: If the units A and B mean X and Y, A is listed with meaning x and B with y:

   If A and B mean only Z then A and B are listed as one word. In some cases A and B may give a different sense also. For example: the word ‘Vilaimagal’ ‘prostitute’, it is possible to assign the meaning ‘price’ to ‘vilai’ and the daughter to ‘makal’, the prostitute is a woman who sells her body. Here, he says the word ‘vilaimagal’ should entered as a single entry.
If we follow the theory, then we have to split the following words also maangkoTi ‘mango trunk’ 1) ‘mā’ ‘mango tree’ and ‘koTi’ ‘trunk’ and 2) the word ‘māṅkaṇi’ ‘mango fruit’ ‘mā’ ‘mango’ and ‘kaṇi’ ‘fruit’. But it is not necessary to split these compounds. Because these compounds are occurring in few places and it was lexicalized in Tamil.

**Conclusion:**

The present paper discusses only a few problem in POS tagging for the Tamil, still a lot more problem exist in Tamil language.

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இலங்கா முன்னாள் அம்பாள் வாழ்ப்பாட்டு

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குறிச்சொல்லா

த் தலைமுறையில் ஏற்றியக்காலத்தில் பிற ஏற்றியக்காலத்திலிலுள்ள கருத்து பதம்படி காந்தலை காட்டிய உலகம் மற்றும் பிள்ளையார் காந்தலை நாற்றுற்றுக்கு முன்னேற்றத்தில் காண்பதற்கு வந்தது . தற்கொன்றும் பாடல்களுள் குறிச்சொல்
நான்களுக்கும் முன்னேற்றம் அவர்களுக்கும் திறந்தெடுத்து . பல்வேறு பல்வேறு பகுதிகளில் தொடர்ந்தெடுத்துக்கும் நிகழ்த்தப்பட்டது . அவர்களின் தொடர்ந்தெடுத்துக்கும் தொடர்ந்தெடுத்து குறிப்பிட்டுக்கும் இயக்கத்தில் குறிப்பிட்டு 
குழாத்தல் உண்டு .

தொடர்

அகத்தியில் பதிவிற்பனை படும் படின் முதலாக அதிகாரிகள் தந்தை எழும்படி கூறையியல் . கருத்துக்கலை கூறையியல் என்று தெரியலை காட்டும் போது பதிவிற்பனை என்று கூறையியல் . பதிவிற்பனை என்று கூறையியல்
பதிவிற்பனை என்று கூறையியல் என்று கூறையியல் .

1. இலங்கா முன்னாள் அம்பாள் வாழ்ப்பாட்டு

இலங்கா முன்னாள் வாழ்ப்பாட்டுக்கு காண்பதற்கு பதிவிற்பனை என்று கூறையியல் . பதிவிற்பனை என்று கூறையியல் 
பதிவிற்பனை என்று கூறையியல் .

2. இலங்கா முன்னாள் அம்பாள் வாழ்ப்பாட்டு

இலங்கா முன்னாள் வாழ்ப்பாட்டுக்கு காண்பதற்கு பதிவிற்பனை என்று கூறையியல் . பதிவிற்பனை என்று கூறையியல் 
பதிவிற்பனை என்று கூறையியல் .
ஆரிமான் என்றுகொண்டு நூற்றாண்டுகள் முழுந்து. நூற்றாண்டுகளுக்கு முல்லியான நூற்றாண்டுகளும் இரண்டு முடியிய நூற்றாண்டுகளும் காணக்கூடும் நூற்றாண்டுகளிற்கு நூற்றாண்டுகளில் குற்றுக்கூடும். தமிழ் தொடர்பின் பதிவுக்கான குற்றுக்கூடும் நூற்றாண்டுகளில் குற்றுக்கூடும். ஆய்வு நூற்றாண்டுகளில் குற்றுக்கூடும் நூற்றாண்டுகளில் குற்று. குற்றுக்கூடும் நூற்றாண்டுகளில் குற்று. குற்றுக்கூடும் நூற்றாண்டுகளில் குற்று. குற்றுக்கூடும் நூற்றாண்டுகளில் குற்று.
3.1 விளக்கம் பார்வை

தன் தியானத்தை ஆலம்பூக்களின் பதினொன்பதாம் பார்வை உள்ளது அல்லாஹ்வின் மகாத் தொன்மையானது. பதினொன்பதாம் பார்வையின் விளக்கத்தை சார்ந்து வருவதற்கு பார்வை உள்ளது பதினொன்பதாம் பார்வையின் விளக்கத்தை சார்ந்து வருவதற்கு. பதினொன்பதாம் பார்வை உள்ளது பதினொன்பதாம் பார்வையின் விளக்கத்தை சார்ந்து வருவதற்கு. பதினொன்பதாம் பார்வை உள்ளது பதினொன்பதாம் பார்வையின் விளக்கத்தை சார்ந்து வருவதற்கு.
3.3 தொன்மை விளக்கம் விளக்கம்:

3.4 கீழே அமைந்து அனைத்து விளக்கங்கள் விளக்கம்:

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Topic D
Computational Linguistics

dharmi dherapippam
Building an Intelligent Rule Based System for Tamil Computing

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Introduction

Computational Linguistics (CL) or Natural Language Processing (NLP) has been developed as a separate discipline involving the subjects, linguistics, computer science, statistics, and logic. This branch of study mainly concentrates on the development of suitable models to represent the linguistic knowledge along with other knowledge to the system for the purpose of analyzing, understanding and generating a text in a natural language. Worldwide many of the tools, developed for these purposes impress our imagination. Programs for orthography and grammar correction, information retrieval from document databases, and translation from one natural language into another, among others, are nowadays available for many languages. However, we have to admit that such programs still lack real intelligence. The ambitious goal of creating software for deep language understanding and production, which would provide tools powerful enough for fully adequate automatic translation and man-machine communication in unrestricted natural language, has not yet been achieved, though attempts to solve this problem already have a history of nearly 50 years.

This suggests that in order to solve the problem, technologists will need to use the methods and results of a fundamental science, in this case linguistics, rather than the tactics of ad hoc solutions. Neither increasing the speed of computers, nor refinement of programming tools, nor further development of numerous toy systems for language “understanding” in tiny domains, will suffice to solve one of the most challenging problems of modern science—automatic text understanding. In this paper I discuss a computer tractable model, which I have designed and adopted in my software viz. Morphological Analyzer, Paradigm Generator, Morph and POS Tagger, and Spellchecker in Tamil, for representing Tamil morphology. I explained, in brief, the representation of morphological information in terms of Machine Readable Dictionary (MRD) through the unification based grammar formalisms, called feature structures (attribute – value systems) and the morphotactics through the mathematical formalism, called Finite State Automata (FSA) and Augmented Transition Network (ATN).

Tamil Morphology

Tamil is a verb final language with SOV pattern. It shows the Subject-Predicate agreement. It is a left branching language. The head of a phrase finds its place at the right most position in that phrase and all the attributes are placed to the left of the head. The words are classified into 4 groups viz. peyarcol (Noun), vinaiccol (Verb), iTaiccol (Paricle) and uricol in traditional grammar and are now grouped into 8, viz. Nouns, Pronouns, Verbs, Adjectives, Adverbs, Postpositions, Conjunctions and Interjections in modern linguistics. Tamil is an agglutinative language; A stem can take many suffixes one after another to have different grammatical forms and semantic notions. A stem with one or two suffixes acts as a stem and further takes more suffixes. And Tamil is a morphologically rich and complex language. Particularly Tamil verbs have a long string of morphemes that express a range of meanings like tense, mood and aspects as well as sense of assertion, negation, interrogation, reflection, emphasis, etc.

Morphology is the branch of grammar that deals with the internal structure of words (Mathews, 1974). i.e. It is the study of meaningful parts of words. The structures of Tamil words are

i) Root (payyan ‘boy’)
ii) Stem + suffix (payyan+kal ‘boys’)  
iii) Stem + suffix +suffix +... (paTi+tt+a:n+a: ‘did he read?’)
iv) Prefix + stem + suffix + ... (‘am+maNavan+ai ‘that student (acc.) ’)
v) Stem + stem (kai+viral ‘hand’s finger’)

In Tamil verbs and nouns are more productive in the sense that they can produce more word forms. The noun takes plural marker to make plural forms and it declines to different forms by taking case markers. Particles and postpositions can be
suffixed to a noun. Similarly, a verb can be conjugated to different forms by suffixing tense markers, person-number-gender markers, infinitive, conditional, relative participle, verbal participle, etc. A verb in Tamil can have more than 1600 forms including forms with clitics, particles, postpositions, etc.

Tamil words are formed by the three morphological processes; inflection, derivation and compounding. The formation of word forms are normally discussed with the following three components, viz. morphological lexicon, morphotactic rules and rewrite rules. The morphological lexicon of Tamil need not have entries for different word forms like paTitta:n ‘read – he’, paTitta:L ‘read – she’, paTikka ‘to read’, paTutta ‘on who read’, paTittu ‘having read’, paTitta:l ‘if one reads’, etc. It only needs to list the unique morphs {paTi}, {tt}, {a:n}, {a:L}, {a}, {u}, and {a:l}. The suffixes apply to {paTi}’read’ and other verbs like {koTu}’give’, {izhu}’pull’, {muRi}’break’, etc. as well.

How does one know that */ttpaTia:n/, as oppose to /paTitta:n/ ‘read-past-he’, from the morphemes {paTi}, {tt} and {a:n} is invalid? The legitimate order of morphemes are expressed by morphotactic rules such as

finite verb $\rightarrow$ verb stem + tense + PNG marker 
relative participle $\rightarrow$ verb stem + tense + rp marker

The order of morphemes in the words is explained by the morphotactic rules. The syntagmatic pattern adds suffixes to the right in the fixed order in an isomorphic way for each added grammatical meaning.

The legitimate addition of suffix to a stem or suffix to a suffix needs more clarification. The suffixation is not always very simple. For example, the morphemes {kal}+{ai} = /kallai/ ‘stone (acc.) ’ and not */kalai/. There are some changes in the morphemes and they are conditional. When {ai} is added to {kal} ‘stone’ the final [l] in {kal} is doubled. i.e. the final [l] of a monosyllabic word is doubled when it is followed by a segment starting with a vowel. Such changes are called morphophonemic changes and are explained by rewrite rules.

\[ l \rightarrow ll/ (C) v -- V \] 
[where v refers to short vowel and V to any vowel]

The morphophonemic processes that are involved in Tamil morphology are assimilation, insertion, deletion and gemination.

Computational Linguistics

Computational linguistics is an interdisciplinary field dealing with the statistical and/or rule-based modeling of natural language from a computational perspective. The grammar of a language is mainly written for human use and they as such cannot be used for computers to process the language. Keeping the linguistic rules as base computer tractable rules or grammatical model has to be evolved. Linguistics aims at to describe the structure of a language in terms of rules. The précised set of rules which generate infinite sentences are considered to be a good grammar. Whereas in computational linguistics how precise or elaborate the grammar given to the system is not very important, but the grammar must be computer tractable and should analyze / generate a text correctly in a short span of time. Accuracy and speed are the main criteria for assessing the efficiency of the model represented to the system. Rest of this paper will discuss the model that represents the morphological information of Tamil to a system.

Computational Morphology

Computational morphology is a subfield of computational linguistics. Computational morphology concerns itself with computer applications that analyze words in a given text, such as determining whether a given word is a verb or noun. As shown above words in a language are not simple lexeme; may be inflected or derived or compounded. It is practically not possible to list the entire word forms in a language, especially for language like Tamil. Then the dictionary will have few lakhs of entries, which will be difficult to the computers to use. The efficient way to represent the word forms would be listing all the unique stems and suffixes in the dictionary and having a program for deriving words from the morphological components. Almost all practical applications that deal with natural language must have morphological component. After all, an application must first recognize the word in question before analyzing it syntactically, or semantically or whatever the case may be.
The typical morphological analyzer for any language tackles mainly three issues: the morphological lexicon, rewrite rules, and morpho-tactic rules. Apart from these, there are other issues which should be addressed when we think of any automatic processor for Tamil. First, the definition of a word. It is very difficult to define word meaningfully. For example, the utterance /paTittukkontirukkiRa:n/ ‘is reading – he’ can also be written as /paTittuk kontu irukkiRa:n/ or /paTittuk konTirukkiRa:n/, /paTittukkonTu irukkiRain/. All the four ways of writing are available and acceptable. Second, writing a word with and without sandhi operation (morphophonemic changes). The word /nu:RkaL/ ‘books’ can also be written as /nu:lkaL/ ‘books’. Third, choice from many alternant forms. There are different past tense markers in Tamil, {t}, {tt}, {nt}, {in}, {R}, {T}, {n} and {i}3. The selection of a correct one for a given verb is not always a rule governed, mostly semantic based. Forth, more of exceptions in paradigm generation. Particularly, a considerable number of verbs in Tamil do not have many word forms. For example, /vil/ ‘sell’, /paya/ ‘be afraid’, /ini/ ‘sweet’, etc. do not have imperative forms; the second one does not have conjugation other than past tense. Any model developed for Tamil must tackle all these issues.

Approaching a Word

For computational purpose it is considered that a word is a chunk of characters between two consecutive spaces or punctuation marks. A word can be a lexeme or inflected or derived or compounded. When it is not a lexeme, it has to be segmented for meaningful components. A word is normally approached from the beginning, i.e. Left to Right (L to R). But it can also be approached from the end, i.e. Right to Left (R to L). In my analysis the latter approach is followed (Ganesan, 1994, 2003)4. There are three reasons for opting R to L approach: one, the word final suffixes are limited when comparing to the stems, which are unlimited. Second, the suffixes are almost unique that they can indicate what could be the stem, whether a noun or verb, etc. Whereas many stems belong to more than one category. Third, a part of a stem can be a stem. For example, in the verb stems such as /aTikol/, /aTipaTu/, /aTipaNi/, atipo:Tu/, aTipiT/, aTiyeTu/, aTivai/ etc the first part /aTi/ forms a stem. These lead to backtracking and slow down the system processing.

Morphological Lexicon

A list of unique morphs constitutes the morphological lexicon of a language. In case of Tamil the list of morphs are not adequate for computational purposes. The morphological lexicon must have more information about the morphological components. They can be provided in the form of feature structure or category – value matrix. For example, take a noun /maram/ ‘tree’. The feature structure of the stem is

/maram/

\[
\begin{array}{l}
cat = \text{noun} \\
num = \text{sing} \\
per = 3 \\
gen = \text{neut} \\
head = \text{maram}
\end{array}
\]

These features are necessary to analyze the inflected word forms like /marama:/ ‘is (it) tree?’ /marankal/ ‘trees’ /marattai/ ‘tree- (acc) ’ etc. and also to verify the agreement with the predicate in a sentence. These features are represented in the form a database, which I call a Machine Readable Dictionary (MRD) in my analysis. There are two MRDs: one for stems and the other for suffixes. The structure of the stem MRD is

Stem/type/girl.cat/status

The stem alternant gets a separate entry in the MRD. For example, the word /maram/ ‘tree’ has two entries, as given below.

maram/01/ian/id/
mara/02/ian/id/

The MRD has four fields. The first field gives the value /head of the stem. Second one gives the noun type that it belongs to. I have classified the noun into 19 types and the verb into 48 types based on the first suffix that the stem takes. Many scholars classified the verbs based on the past tense markers that the verb takes. But that classification is not handy to work computationally. These stem type numbers account for many features that are necessary to parse the word meaningfully and to have feature unification (explained in the next section) which is exhibited by the components. The
third field gives the grammatical category of the stem, in this case it is an inanimate noun (ian) and the forth field shows whether the stem can be an independent (id) or dependent (de) component. Similarly, the suffix MRD has the following structure.

Suffix/type/grl.cat/word tag /

Here too there are four fields. The first one gives the value of the suffix. The second field, “type” gives the direction to the machine, where the possible morphological components, that can go with this suffix in the next (towards left) level, are stored. While the third one gives the grammatical value of the suffix, the forth one marks the word level tag information, if the suffix is the determining component. Otherwise it is given as /0/.

a: L/36/ 3sf/FV/ um/10/part/0/

The selection of the first morpheme after the stem is only phonologically conditioned, but also, in some cases, grammatically and semantically conditioned. As all the words are enumerated in the MRD, the type number tackles the selection of the its adjacent component. The type number unifies the stem or a morphological component and its next morphological component. For example,

/maram/  
\[
\begin{align*}
\text{cat} &= \text{noun} \\
\text{per} &= 3 \\
\text{no} &= \text{sing} \\
\text{type} &= 1 \\
\text{head} &= \text{maram}
\end{align*}
\]

/mara/  
\[
\begin{align*}
\text{cat} &= \text{noun} \\
\text{per} &= 3 \\
\text{no} &= \text{sing} \\
\text{type} &= 2 \\
\text{head} &= \text{mara}
\end{align*}
\]

\{nkal\}  
\[
\begin{align*}
\text{cat} &= \text{noun} \\
\text{type} &= \text{S1} \\
\text{head} &= \text{nkal}
\end{align*}
\]

\{a:\}  
\[
\begin{align*}
\text{cat} &= \text{noun} \\
\text{type} &= \text{S2} \\
\text{head} &= \text{a:}
\end{align*}
\]

Here the feature matrix for /mara/ ‘tree’ and {nkal} ‘plural marker’ unify on the basis of the category “type”. The stem /mara/ belongs to noun type 2 and {nkal} belongs to S1, where S1 is the stem group which includes the noun classified as type 2. Similarly the feature matrix for /maram/ ‘tree’ and the morpheme {a:} ‘interrogative marker’ unify, as the stem group S2 includes the noun type 1. But, /maram/ + {nkal} or /mara/ + {a:} does not unify. Therefore the formation of ungrammatical forms are avoided through feature based grammar.

Rewrite rules

The rewrite rules explain the phonological changes that take place when two morphological components are combined. This issue of rewrite rules is tackled by taking the alternant forms of morphemes into account in the morphological lexicon and by assigning proper value for the category called “type”, both in the stem MRD and the respective suffix MRD. The Finite State Automaton which models the morphological processes of Tamil is explained below.

An FSA is usually modeled by a program. The program receives a string from an input tape. It reads one character at a time from left to right. After reading the last character, it either accepts or rejects the string. An FSA consists of a finite number of states. First the machine will be in a state called initial state. As it scans the input string character by character it takes different states. One or more states will be marked as final states. The states are represented by small circles and are labeled q0, q1, q2, etc. as given in the following example. Here q0 is the initial state. q4 is the final state and is indicated by double circle. The transitions from one state to another is indicated by a labeled arc. The machine makes discrete moves from one state to another, the possible moves being just those given in the transition arc. After the last character of the input is scanned if the automaton is in the final state, the input is accepted: otherwise, it is rejected. (For more details see Jurafsky, 2000).
In my approach, the functioning of the automaton differs in two respects. First, the automaton is not reading the string in the input tape character by character. Instead, it truncates the input string character by character from the left hand side. Second, the transition from one state to the next is not on the basis of positive match each character. Instead, the remaining string after truncation is compared with the labeled arc and if it matches then it moves to next state. Otherwise it remains in q₀. Another form of FSA is Finite State Transducer (FST). An FST is a FSA, but instead of scanning one tape, it scans two tape simultaneously. One is an input tape and the other is the output tape. The difference is that the transitions – the arcs in the diagram – are labeled with instruction rather than simple symbol.

For example consider the finite verb /pa:Tina:n/ ‘sing – past – he’. The system first finds the match in the stem MRD. Since the word is not a lexeme, it does not find a match. Then it starts to segment the word using FST for L₁. This Transducer truncates the first character from the input string. The remaining is /aTina:n/. It compares with the LHS of the labeled arc and since there is no match it takes the path *:* and remains in the same state. Then it truncates the next left most character. Now the remainder is /Tina:n/. Since there is no match, it remains in the q₀ state. It repeats the same till the remainder becomes /a:n/. When the remainder is /a:n/, it takes the path labeled as [(a:n): PNG] and reaches the state q₁, which is a final state. It accepts the /a:n/ and writes as PNG in the output tape.

\[
\begin{align*}
L₁ = & \quad \text{a:n: PNG} \\
& \quad \text{a:L: PNG} \\
& \quad \text{a:r: PNG} \\
& \quad \text{a:rkaL: PNG} \\
& \quad \text{yatu: PNG} \\
& \quad \text{yana: PNG} \\
\end{align*}
\]

With the remaining part of the input, /pa:Tin/ the system takes the FST for L₂. Now the system truncates the first character and compare the remainder /aTin/ with the labeled arcs. As there is no match it takes the path *:* and remains in the state q₀. It repeats the procedure till the remainder becomes /in/. Now it takes the path /{in}: past/ and reach the state q₃, which is a final state. The system writes /past/ in the output tape. Now the system with the remainder /pa:T/ looks for a match in the stem MRD as per the information given in the “type” and verifies in S file whether the verb type (1) is listed against S2. If it matches in stem MRD and in S file then /verb/ is written in the output tape.

\[
\begin{align*}
L₂ = & \quad \text{in: past} \\
& \quad \text{i: past} \\
& \quad \text{kiR: pre} \\
& \quad \text{kinR: pre} \\
& \quad \text{v: fu} \\
\end{align*}
\]

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The information on the output tape i.e. PNG, past, and verb are reversed (as the input word was analyzed from the end) and are arranged as verb, tense and PNG. Now the ATN given below for the FV takes these as input and accept the given word is a finite verb.

**Morphotactic Rules**

The morphotactic rules explain the arrangement order of morphemes in the word forms. The morphotactics is modeled through an Augmented Transition Network (ATN), an abstract machine like Finite State Automata (FSA).

Similarly in ATN the transitions are labeled with strings (terminal or non terminal). For example the morphotactic rule for a Finite verb is

\[ FV = \text{verb stem} + \text{tense marker} + \text{PNG marker}. \]

This can be mapped to an ATN as follows:

Consider the following Finite verbs in Tamil.

1) \( /\text{pa:T}+\{\text{in}\}+\{\text{a:n}\}'\text{sing-past-he'} \)
2) \( /\text{pa:T}+\{\text{i}\}+\{\text{yatu}\}'\text{sing-past-it'} \)
3) \( /\text{pa:Tu}+\{\text{kiR}\}+\{\text{a:n}\}'\text{sing-pre-he'} \)

The mapping for the three FVs are one and the same, but the morphemes combined are not the same. In (1) and (2) the past tense markers are \( \{\text{in}\} \) and \( \{\text{i}\} \) respectively, which are determined by the PNG markers, \( \{\text{a:n}\} \) and \( \{\text{yatu}\}' \). Similarly in (1) and (3) the tense markers are \( \{\text{in}\} \) and \( \{\text{kiR}\} \), which determine the choice of the stems \( \{\text{pa:T}\} \) and \( \{\text{pa:Tu}\} \). Here the unification of features are on the category “type”. In the former \( \{\text{a:n}\} \) belongs to type 36 and the morpheme \( \{\text{in}\} \) is listed in the next level under 36, but not the morpheme \( \{\text{i}\} \). So, the system makes correct analysis and never allows the combination of morphemes \( \{\text{i}\} \) and \( \{\text{a:n}\} \) or \( \{\text{in}\} \) and \( \{\text{yatu}\} \).

**Conclusions**

The twenty-first century will be the century of the total information revolution. The development of the tools for the automatic processing of the natural language spoken in a country or a whole group of countries is extremely important for the country to be competitive both in science and technology. To develop such applications, specialists in computer science need to have adequate tools to investigate language with a view to its automatic processing. One of such tools is a deep knowledge of both computational linguistics and general linguistic science. The models designed for Tamil morphology is purely based on linguistic description and those rules are converted into the abstract models.

**Notes**

1. The terms computational linguistics and Natural Language Processing are used synonymously, though there are differences between them.
2. Morphological lexicon is the inventory of all morphs in a language.
3. \( \{t\}, \{tt\}, \{nt\} \) and \( \{in\} \) are the four past tense markers. The others can be derived from these using some phonological rewrite rules. But, here all are taken as markers.
4. Backtracking a procedure where the system comes back to the same position a number of times when it fails in its previous steps.

5. In S file the verb types / noun types which can go with a particular type of suffix are listed as S1, S2, .... For example, if a suffix is marked with S1 in the type comes to the stem MRD, and if there is a match for the verb stem, then it compares whether the type number of the verb is included in the S1 list. If so, the word is accepted.

6. In this system \{yatu\} is taken as an alternant form of the PNG marker \{atu\}. It first segments \{yatu\} as a morpheme and later realizes to \{atu\}.

References

A Rule Based Converter of Formal Tamil to Colloquial Tamil (FT2CT) - An Application of Turing Machine

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ABSTRACT

Recent Machine Translation (MT) has focused on translation of non-colloquial language. Teaching the diglossic situation of a language like Tamil is always a challenging work, and requires e-learning tools to express the difference between the multiple faces of the language. Here the idea is to make use of the existing rules that defines the convergence of colloquial language from the formal one. This paper is an attempt to develop a fully automatic NLP system to translate the Formal Tamil (FT) to Colloquial Tamil (CT). Automation of the translation is achieved by expressing the conversion rules in terms of Turing Machine of Finite Automata paradigm. Though the Turing Machine handles word by word, the overall system is capable of converting a FT document into a CT document. Here the system performance is around 82%.

1. Introduction

In many Languages the colloquial version as found in typical conversations is different than text found in technical manuals, newspapers and books. The chance for a language which has two forms (colloquial and formal) is termed as diglossic situation. Tamil is one such language which has diglossic situation namely Formal Tamil (FT), mostly for writing and Colloquial Tamil (CT), for speaking. The language of writing differs considerably from the language of everyday conversation – so much so that there is no universally accepted way of writing the colloquial variety in Tamil script. Handling this diglossic situation within Tamil Nadu, would not be a major problem. But for the people who knows only writing Tamil (like Tamilians who have born and brought up in foreign countries) faces some difficulties to learn the colloquial Tamil. As most of the Tamil course materials available are for writing Tamil, those who do not have the practice of speaking in Tamil will find it difficult to identify the equivalence between these two forms. And another problem is that most of the times it is not possible to avoid the influence of formal Tamil in their speech. More than 40% of Tamil NRI kids are coming from Non-Tamil speaking backgrounds to primary schools [4]. This implied a lack of authentic context of the usage of the Mother Tongue Language at home.

A great deal of Machine Translation (MT) has focused on translation of non-colloquial language. Thus it would be a noteworthy work for Tamil Language and Tamil Computing researchers to focus on the development of colloquial Tamil teaching aid which gives the equivalent formal Tamil. The part of Tamil Language researchers have started considering this issue during 1980s itself [2]. A well defined collection of rules have been established for the conversion of colloquial Tamil to formal Tamil. So far 29 rules have been derived based on phonology and morphology of Tamil. Now it is our turn to automate these rules.

Thus a relationship between complexities in learning the oral language in parallel with formal version is an emerging field in the current research of natural language processing. Aim of this research paper is to present the automation of the derived rules of Formal Tamil (FT) to Colloquial Tamil (CT) converter using a virtual Turing Machine Automata as an implementation aid. This work is expected to bridge the gap between the formal and colloquial Tamil of NRI Tamil learners.

2. System Design – FT2CT

Any formal Tamil document will be the input for the system and the expected outcome is a corresponding colloquial Tamil document without any change in the meaning. Figure 1 shows the overall architecture for the converter. The word splitter splits the document into individual words. Before splitting, all the punctuation marks have to be hidden. Turing machine is constructed as a rule based system of FT2CT. Each word of the document will be the input for the Turing machine. TM construction is discussed in the fore coming chapters.
Why TM?

Turing Machine is essentially a finite automaton that has a single tape of infinite length of which it may read and write data. One advantage of Turing machine over programs as representation of what can be computed is that the Turing machine is sufficiently simple that we can represent its configuration precisely. And comparing to programming languages the state of the variables can be followed in a more precise and understandable manner. [6]

Turing Machine has great computational capabilities that can be used as a general mathematical model for modern computers. It can model even recursive enumerable languages. Thus a Turing machine can model all the computable functions as well as the languages for which the algorithm is possible. Turing Machines can be programmed. Hence TM accepts a very large class of languages. So it is considered as a most powerful computational model.

Conceptually a Turing machine, like finite automata, consists of a finite control and a tape. At any time it is in one of the finite number of states. The tape has the left end but it extends infinitely to the right. It is also divided into squares and a symbol can be written in each square. However, unlike finite automata, its head is a read-write head and it can move left, right or stay at the same square after a read or write. Given a string of symbols on the tape, a Turing machine starts at the initial state. At any state it reads the symbol under the head, either erases it or replaces it with a symbol (possibly the same symbol). It then moves the head to left or right or does not move it and goes to the next state which may be the same as the current state. One of its states is the halt state and when the Turing machine goes into the halt state, it stops its operation.

3.1. Formal Definition for Turing Machine

\[ M = (Q, \Sigma, \tau, \delta, q_s, B, F) \]

Where,

- **M**: The Turing Machine
- **Q**: The finite set of states of the finite control.
- **\Sigma**: The finite set of input symbols.
- **\tau**: The complete set of tape symbols; \( \Sigma \) is always a subset of \( \tau \).
- **\delta**: The transition function \( \delta( q, X ) = ( p, Y, D ) \)
- **q_s**: The start state, a member of Q, in which the finite control is found initially

\( X \) is an input symbol
\( Y \) is a symbol in \( \tau \), for replacement
\( D \) is the direction for next move (left or right)
4. System Construction

Main focus of this paper is the construction of Turing Machine for predefined rule.

4.1. Rule 1

The main aim of this paper is the construction of Turing Machine for predefined rule.

\[ \text{TM}_1 = \{q_s, q_1, q_f\}, \{\text{Tamil Letters}\}, \{\text{Tamil Letters}, \text{B}\}, \delta, q_s, B, \{q_f\} \]

Where \( \delta \) is,

\[ \delta (q_s, \text{Eagaram}) = (q_1, \text{Eagaram}, R) \]
\[ \delta (q_1, \text{Agaram}) = (q_2, \text{Agaram}, L) \]
\[ \delta (q_1, \text{Aigaram}) = (q_2, \text{Aigaram}, L) \]
\[ \delta (q_2, \text{Eagaram}) = (q_f, \text{Yeagaram}, R) \]

Figure 2 – TM for Rule 1

4.2. Rule 2

The main aim of this paper is the construction of Turing Machine for predefined rule.

\[ \text{TM}_2 = \{q_s, q_1, q_f\}, \{\text{Tamil Letters}\}, \{\text{Tamil Letters, B}\}, \delta, q_s, B, \{q_f\} \]

Where \( \delta \) is,

\[ \delta (q_s, \text{Vugaram}) = (q_1, \text{Vugaram}, R) \]
\[ \delta (q_1, \text{Agaram}) = (q_2, \text{Agaram}, L) \]
\[ \delta (q_1, \text{Aigaram}) = (q_2, \text{Aigaram}, L) \]
\[ \delta (q_2, \text{Vugaram}) = (q_f, \text{YeVugaram}, R) \]

Figure 3 – TM for Rule 2

This machine is only for Rule 1, the solid lines denote the actual transition and the dashed lines indicate the transitions for the forthcoming rules.

4.3. Rule 3

The main aim of this paper is the construction of Turing Machine for predefined rule.

\[ \text{TM}_3 = \{q_s, q_1, q_f\}, \{\text{Tamil Letters}\}, \{\text{Tamil Letters, B}\}, \delta, q_s, B, \{q_f\} \]

This machine is only for Rule 1, the solid lines denote the actual transition and the dashed lines indicate the transitions for the forthcoming rules.
Where \( \delta \) is,

\[
\delta \left(q_1, \text{Aigaram}\right) = (q_6, \text{Agaram, R})
\]

**Figure 4 – TM for Rule 3**

**4.4. Rule 4**

\[\text{முருகும் மூடி இசைகளால் "இந்தான் மூடி உண்டு பாதுகாப்பு "த்தை" மூடி "இந்தான்" மூடி மரசொடரின் (சி: முருகும் - மூடி, முருகும் - மூடி)}\]

\[\text{TM}_4 = \{(q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7, \{q_8\})\} \]

Where \( \delta \) is,

\[
\delta \left(q_1, \text{Eagaram}\right) = (q_2, \text{Eagaram, R})
\]

**Figure 5 – TM for Rule 4**

**4.5. Rule 5**

\[\text{காசிகுரைக் மூடி இசைகளால் தொடர், தொடர், தொடர் விளையாட்டு புள்ளியில் விளையாடும் பாதுகாப்பு மூடி இசைகளால் முருகும் தொடர்} \]

\[\text{தொடர் புள்ளியில் விளையாடும், தொடர் விளையாட்டு புள்ளியில் விளையாடும் முருகும் தொடர்} \]

\[\text{TM}_5 = \{(q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7, q_8, \{q_9\})\} \]

Where \( \delta \) is,

\[
\delta \left(q_0, \text{SVS}\right) = (q_1, \text{SVS, R}), \delta \left(q_0, \text{LV}\right) = (q_6, \text{LV, R})
\]

**Figure 6 – TM for Rule 5**

[SVS \(\rightarrow\) Short Vowel in Solo and LV \(\rightarrow\) Long Vowel]

**4.6. Rule 6**

\[\text{காசிகுரைக் மூடி இசைகளால் "சிறிய" மூடி இசைகளால் விளையாடும் பாதுகாப்பு "சிறிய" மூடி "சிறிய" மூடி முருகும் (சி: காசிகுரை - சிறிய", காசிகுரை - சிறிய")} \]

\[\text{TM}_6 = \{(q_0, q_1, q_2, q_3, q_4, \{q_5\})\} \]
Where δ is,

\[ \delta (q_s, SVS) = (q_1, SVS, R), \]
\[ \delta (q_1, n) = (q_2, n, R), \]
\[ \delta (q_1, m) = (q_2, m, R), \]
\[ \delta (q_2, B) = (q_3, B, L), \]
\[ \delta (q_3, n) = (q_4, B, R), \]
\[ \delta (q_3, m) = (q_5, B, R) \]

**Figure 7 – TM for Rule 6**

[ISVS → Except SVS]

**4.7. Rule 7**

\[ \text{TM7} = \{(q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7, q_f), \text{ (Tamil Letters), (Tamil Letters, B), } \delta, q_s, B, \{ q_f \} \} \]

Where δ is,

\[ \delta (q_0, SV) = (q_1, SV, R), \]
\[ \delta (q_0, LV) = (q_4, LV, R), \]
\[ \delta (q_1, Igaram) = (q_7, Igaram, R), \]
\[ \delta (q_1, B) = (q_6, Yi, R), \]
\[ \delta (q_2, Yi) = (q_3, Yi, R), \]
\[ \delta (q_4, Yi) = (q_5, Yi, R), \]
\[ \delta (q_3, Yi) = (q_6, Yi, Yi\text{E}, R), \]
\[ \delta (q_5, Yi) = (q_7, Yi, Yi\text{E}, R) \]

**Figure 8 – TM for Rule 7**

5. Performance Analysis

The rule based system of colloquial to Formal Tamil conversion is tested with 1282 words totally. Table 1 gives the performance of each rule.

<table>
<thead>
<tr>
<th>Rule</th>
<th># of Test words in FT</th>
<th># of Correct CT words</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>243</td>
<td>203</td>
</tr>
<tr>
<td>2</td>
<td>231</td>
<td>190</td>
</tr>
<tr>
<td>3</td>
<td>152</td>
<td>134</td>
</tr>
<tr>
<td>4</td>
<td>271</td>
<td>220</td>
</tr>
<tr>
<td>5</td>
<td>289</td>
<td>233</td>
</tr>
</tbody>
</table>
Overall system performance is 81.97%. Reason for degradation is that for some words the converted version changes the intended meaning of the input word. For example as per rule 1 the term “Eadai” will get converted into “Yadai”, which has completely different meaning (“eadai” means “in between” and “yadai” means “weight”). Such special cases need to be handled separately.

6. Conclusion and Future Work

In this work, Turing Machine is constructed for 7 rules of FT2CT conversion. This system can act as a convenient tool to develop e-tutor kit to teach colloquial Tamil to NRI Tamil students. Likewise there are totally 29 rules exists. By implementing all the 29 rules a complete version of formal Tamil to colloquial Tamil converter can be published. It is highly modular allowing rapid extension to new target languages which has diglossic situation, provided the relevant rules need to be identified in advance.

Here the work is limited only for words, and is extendable to sentences and documents which are in colloquial form. Further work is planned to focus on the reverse process (i.e. Colloquial Tamil to Formal Tamil), which can create great impact on formalizing the output of speech to text converter and many like documentation works. This can also be added as a add-on feature in a Tamil Text editor for special purposes.

References

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2. N. Deiva Sundaram (Diglossic Situation in Tamil – A Sociolinguistic approach, Ph.D. Thesis submitted to the University of Madras, 1980, Chennai)
4. Enhancing Learning of Tamil Language in a One-to-One Computing Environment Sivagouri Kaliamoorthy, INFITT Tamil Language Conference.
5. A Lexicalist Approach to the Translation of Colloquial Text, Fred Popowich et al.,

<table>
<thead>
<tr>
<th>6</th>
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<th>141</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>167</td>
<td>129</td>
</tr>
</tbody>
</table>

**Table 1 – Rule wise test results**
A Parsing Engine for the Study of Tamil (Finite –Tensed) Verb Structure

M.Somathasan
R.Saranya
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Introduction

Tamil is one of the South Dravidian Languages in India. It is agglutinative in nature and as a result, highly rich in morphological processing like inflection and derivation which cause many orthographic changes. Further, Tamil language has a rich literary and grammatical tradition. The earliest extent of Tamil work tolkaapiyam is a grammatical treatise which is considered to have been written before the beginning of the Christian era. It is very gratifying to note that the author of this great grammatical work was well known for many problems of Tamil morphology and morpho-phonemics that deal with internal organization of words including sandi rules. It is not claimed that it is a complete grammar. However, the attempts in morphological works like morphological parsing of verbs are still being done by many scholars in order to achieve a complete grammar in Modern Tamil in the aspect of natural language processing (NLP).

Relating to parsing, exhaustive and detailed study of parsing Tamil verbs under various head words like infinitive, time expression, relative participle, verbal participle and person, number gender etc. is being worked out by various scholars at the Center of Advanced Study in Linguistics (Annamalai University), Tamil University, Madras University, and so on.

In general, to parse a word is to provide an explanation of its grammar. It includes the morphotactic structure of word and its rules. In parsing, the word is grammatically named; and the components or morphs of it are explained as well.

Once a formal parsing was experienced in the study of grammar to great extent; but now it has a less important place in the academic arena. For instance, the term parsing is now-a-days rarely used in the school level examinations, as well. In a number of examinations, however, the students are still asked to explain the grammatical function of certain words in a given context, and on the other hand it really amounts to parsing process. As a result, the students are subjected to follow a scheme of parsing properly. For instance, if we are asked to explain the grammatical function of particular words, we will generally find it necessary to give the scheme and we are free to add other notes to make it clear that we fully understand the grammatical points involved. Though the vital grammatical points are given below, for this paper the grammatical category verb is considered for the study of its internal structure.

- **Nouns:** Number, case, reason for case
- **Pronouns:** Kind, person, number, case, reason for case
- **Verbs:** Kind - transitive or intransitive or even ditransitive, conjugation - strong or weak, voice, mood, tense, person, number, agreement with subject.
- **Auxiliaries** should be taken with the verb to which they belong and the compound verb parsed as a whole.
- **Participles:** Tense, voice, word qualified
- **Gerunds:** Tense, voice, case (as for nouns)
- **Infinitives:** Tense, voice, if verb noun – case (as for nouns), if qualifying infinitive- word qualified
- **Adjectives:** Kind, degree (if any), word qualified
- **Adverbs:** Kind; degree (if any), word qualified (In the case of relative adverbs, name the antecedent)
- **Preposition:** Word governed

Objectives of the Paper

The objectives of this paper are:

- To parse the finite verbs (tensed - present, past and future) found in Modern Tamil with the labeling of its component tags through a computer program written in VB6.
- To create a **Tree Diagram or Parse-Tree** of the given verb, according to morphotactic rules. The visual parse tree will make us understand the components of the parsed verb easily.
To compile a lexicon consisting of nearly 800 root verbs for this article. The lexicon is a must for returning/extracting information, wherever as well as whenever necessary, while parsing the given verb.

Reviews

The various works on morphological analysis like morphological parsers have been developed by many scholars in India. But, for all we know, the works have not been seen on market, yet. Thus, as we, a student of linguistics at CAS in linguistics, Annamalai University and teacher of English at Trincomalee, Sri Lanka and the Associate Professor of linguistics at CAS in Linguistics, Annamalai University are very much interested in the field of NLP, we would like to engage ourselves into developing this user-friendly and detailed Tamil Verb Parsing Engine tool for modern Tamil finite verbs (tensed) as our complimentary contribution to our mother tongue, i.e. Tamil language spoken in India, Sri Lanka, and other countries in which the Tamil diasporas live.

Methodology of Morphological Parsing Engine

Generally morphological parsing engine is a computer program that performs the parsing process of the words based on morphotactic rules or analysis. In our program, the engine (program) obtains an input as a string (verb tokens) from the user for parsing process and it almost verifies whether the given string is a valid construction of the source language (Tamil).

As far as the syntactic analysis is concerned, parsing is explained in two terms which are top - down parsing and bottom - up parsing. Similarly, left to right parsing and right to left parsing, are advocated for morphological analysis. To this seminar paper, the right to left parsing and the top - down parsing are applied for recognizing the verb root, verb stem and also the suffixes that are affixed to the stem, and for creating a parse-tree, respectively. Further, right to left parsing is an attempt to find the suffixes affixed with an input string and by starting from the right to left order and since it is an attempt to find the left most inflecting base for an input string, a right to left parser may require to do back tracking, i.e. the repeated scan of the given input until the base of the input string is obtained. Top - down parsing starts from root node of the given string and proceeds towards leaves.

Considering this article, the following three steps are involved in the methodology of the Parsing Engine for Modern Tamil Verbs (Tensed).

a. Data Collection: For the present study, most of the finite verbs in modern Tamil have been collected from the KRIYA (Tamil Dictionary), text books and dailies as the primary source of data.

b. Coverage: In finite verbs, only the tensed (present, past, and future) verbs have been taken into consideration. The rest of the verbs like imperative, hortative and optative that belong to tense less finite verbs, are not taken for account for this paper.

c. Data Analysis: The above mentioned data are analyzed by applying computational linguistic approach for identifying the components or morphemes of the finite verbs like present, past and future tense markers; Person-Number - Gender suffixes; and the stem or its alternants that have to be parsed through the computer program.

Hypothesis

After implementing our concept in this program, the completion of our task (the product, i.e. Tamil Verb Parsing Engine) will be fully successful without any complication.

Description

1. Parse Tree (Tree Diagram or Verb Inflection Tree) of a String

Parse tree refers to an instance of a non-terminal in a given string by the right hand side of the production rule, which left hand side is the non-terminal to be replaced. It produces a new string from a given string, therefore the process
(inflection) can be used repeatedly to obtain a new string from a given string, and if a string obtained as a result of
inflection contains only terminal symbols then no further parsing is possible. While inflecting a string, ever inflection or
derivation is considered to be a step in the parse-tree construction; then we get a graphical display of inflections of a
string as a tree, called as parse tree of a string. It satisfies the following requirements:

1. All the leaf nodes of the tree labeled by terminals of the grammar.
2. The root node of the tree is labeled by the start symbol of the grammar.
3. A string whose inflection is represented by the given tree, is a string obtained by concatenating the labels of
the leaf nodes of parse tree in a left to right order.

2. Parsing

The Tamil Verb Parsing Engine (TVPE) is a tool basically used to identify the morphemes or components of a complex or
derived verb. It takes a derived verb as an input string and separates it into the root verb and the corresponding
morphemes as tense marker and PNG marker. The function of each suffix or morpheme is labeled. It uses rule-based
approach. The steps involved are as follows:

1. A tensed finite verb is given as an input. Then, the morphological parsing engine or analyzer starts scanning
the string from right to left to looking for suffixes. A list of suffixes ruled out based on lexical morphology is
maintained for this purpose.
2. It, then, searches for the longest match in the suffix list.
3. The morphological analyzer removes the last suffix; and then, determines its tag, finally adds it with the word’s
suffix list.
4. Then, it checks the remaining part of the verb in the lexicon of nearly 800 verb roots (for the purpose of this
seminar article) and exits if the entry is found.
5. Based on the identified suffix, it generates the next possible suffix list.
6. The second step is repeated with the current suffix list.

Examples

Simple Present

1. பெச்சுகிராணு (peecukiRaan)
   பெச்சு < Verb_Root >
   பொகு < Present Tense >
   பொண்டை < 3rd Person Singular Masculine >

2. பெச்சுகின்றாண (peecukinRaan)
   1. பெச்சினாண (peecinaan)
      பெச்சு < Verb_Root >
   1. பெச்சுவாண (peecuvaan)

2. பெச்சும் (peecum)
   பெச்சு < Verb_Root >
   பொூதை < Future Tense & 3rd Person Singular Neuter >

Note that in the above examples, the suffixes italicized in the following set of grammar, are affixed with the verb stem
peecu for denoting tense and person-number-gender (PNG).
V → Sₜ T PNG (structure of finite verb - tensed)
Sₜ → peecu (verb_root)
T → Pₚ / Pₚ / Fₚ
Pₚ → -kiR / -kinR / -kkiR / -kkinR (present tense markers)
Pₚ → -in / -t / -tt / -nt / -T / -R / -n / -i (past tense markers)
Fₚ → -v / -pp / -p (future tense markers)

-um- (future tense & 3rd person singular neuter)

V stands for Verb
Sₜ stands for STEM
T stands for TENSE
PNG stands for PERSON-NUMBER- GENDER
Pₚ stands for PRESENT
Pₚ stands for PAST
Fₚ stands for FUTURE

Implementation of Parsing Engine:

The parsing engine for the above grammar can be implemented by writing a program in VB6 to process the input string for performing the successful completion of the parsing. Thus, the parsing engine scans the characters of the input string, and whenever it gets the sufficient characters which constitute a token of the string, it reflects the morphologically parsed output. In order to perform this task, the parsing engine must know the tokens of the string to be implemented, i.e. it must know the keywords, identifiers, operators, delimiters, punctuation symbols, etc. Then, when it scans the source string, it will be able to return a suitable token, whenever it encounters a lexeme for a token. The lexeme is a term used to refer to a sequence of characters that expresses lexical as well as grammatical meanings in the given string that is matched by the pattern specifying the identifiers, operators, keywords, delimiters, punctuation symbols, etc. in the language. Therefore, the features involved in the design of the parsing engine are:

1. Specification of the token of the input string.
2. Designing a suitable recognizer for recognizing the tokens.

Sample Visuals:
Conclusion:
This attempt results the output as a full-fledged efficient parser for Modern Tamil Verbs (tensed). The aim of this attempt is successfully attained, and it implies that the hypothesis is fully proved and accepted. Further, this tool will be very useful for all kinds of learners, language teachers, researchers, programmers, and scholars who are involved and work in the field of computational linguistics particularly in machine translation and Tamil verb (tensed) grammar analyzing and teaching, i.e. Tamil computation.

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3. Joakim Nivre, *Dependency Grammar and Dependency Parsing*
Machine Learning of Sandhi Rules for Tamil

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Dr.M.Ganesan
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Abstract

This paper presents machine learning solutions to a practical problem of morphophonemic changes. The machine learning algorithms treat the morphology acquisition problem as one of ‘learning to map’ one form of representation into another. For example, sequence of characters into morphemes, set of morphemes into a grammatical category.

The study which deals with all kinds of changes like addition, deletion, alternation etc., when two or more morphemes or words occur together is called ‘Sandhi’. In general the end of the first morpheme or word and the beginning of the following one are taken into account in Sandhi. The end and the beginning of morphemes that are added can be either a vowel or a consonant or consonant cluster. There are many combinations of such characters. These Sandhi rules should be explicitly specified for morphological analysis in a rule based system. These rules can be learned automatically by the system from the training samples and subsequently be applied for new inputs.

In this paper we discuss the machine learning model which learns the morphophonemic rules from the training data. When adding case suffixes to nouns, certain nouns undergo sound changes. The Sandhi rules describe these changes. In this model, we have trained the system to learn the noun inflectional patterns. The Decision tree algorithm is used for modeling.

Introduction

Many of the Indian languages are morphologically rich languages. Words in these languages are formed by combining meaningful constituents, called morphemes. Some morphemes are free morphemes and others are bound morphemes which join with free morphemes. The way in which these constituents are organised in word-forms follows morphological rules. Morphemes may have varied form in particular contexts, when we speak of allomorphic variations of that morphemes.

One important aspect of morphemes is that they change when grouped together. Actually, they influence each other phonologically. These changes are called morphophonemic changes so that we can say that they are changes in the phonological structure of words which occur when morphemes are grouped together.

When suffixes are added with words, a change in the word or addition of consonant or vowel takes place depending upon the nature of the suffix. The rules that make a change in words when adding suffixes are called sandhi rules. The word 'sandhi' is a Sanskrit word meaning ‘meeting together’. Application of sandhi rules is necessary to correctly write and pronounce complex word forms.

Morphophonemics is the study which deals with the phonemic variations of a single morpheme in the given environment. It deals with all kinds of changes like addition, deletion, change etc when two or more morphemes occur together when they stand in conjunction, is called sandhi.

It is undeniable that the morphological aspect is indispensable for making sandhi rules. Internal sandhi occurs when two morphemes are added with one another and external sandhi occurs between two free-forms or two grammatical forms. The internal sandhi occurs in the morphological structure because, it relates to the sandhi of the morphemes within a word. So it is called “morphological sandhi”. The latter one occurs in the syntactic structure of a language. So, it is called
compounds or phrases or “syntactical sandhi”. A morphophonemic rule has the form of a phonological rule, but is restricted to a particular morphological environment.

An example of a morphophonological alternation in English is provided by the plural morpheme, written as "-s" or "-es". Its pronunciation alternates between [s], [z], and [iz], as in cats, dogs, and horses respectively. A purely phonological analysis would likely assign to these three endings the phonemic representations /s/, /z/, /iz/. On a morphophonological level, however, they may all be considered to be forms of the underlying object /z/, which is a morphophoneme. The different forms it takes are dependent on the segment at the end of the morpheme to which it attaches – these dependencies are described by morphophonological rules. The alternative realisations of morphemes are called allomorphs.

**Machine Learning**

Machine learning is one of the important research and application areas of artificial intelligence (AI). Machine learning is concerned with acquiring knowledge from an environment in a computational manner, in order to improve the performance. Machine learning is the capability of a computer to learn from experience (training data) and to extract knowledge from examples. A successful learner should be able to make general conclusions about the data it is trained on. This allows it to act appropriately in new situations. Many machine learning techniques have been applied to NLP tasks.

Most natural language processing (NLP) tasks require the translation of one level of representation to another. For example, in text to speech systems, the spelling representation of words is translated to a corresponding phonetic representation; in part-of-speech (POS) tagging, the words of a sentence are translated into their contextually appropriate POS tags. All these types of NLP tasks can be formulated as a classification task, and are therefore appropriate problems for machine learning methods. Classification-based learning starts from a set of instances (examples), each consisting of a set of input features (a feature vector) and an output class.

**Decision Trees**

Decision trees are one of the techniques for solving classification problems. Decision trees are easy to create, to understand, and to apply, and they are quite accurate. Other important methods are maximum entropy models, memory-based learning, neural networks and Genetic algorithms. Decision trees have been applied to a wide range of NLP problems including grapheme-to-phoneme conversion, part-of-speech tagging, tokenization, parsing, language modelling, classification of unknown proper names and spam detection. Many of these methods directly apply decision trees as classifiers [Black et al.].

Decision trees are learned from training data. Each data item consists of a set of features describing an object and the class of the object. Table 1 shows an example data items. Decision trees are recursively built beginning with the top most node by (1) computing the best test for the current node according to some splitting criterion, (2) creating a subnode for each possible outcome of the test, and (3) recursively expanding each subnode in the same way until a given stopping criterion is satisfied. Usually, the decision tree is simplified (pruned) in order to avoid overfitting of the training data[J.R.Quinlan].

**Sandhi rules in Tamil**

Tamil is an agglutinative and concatenative language, where morphemes are strung together to form long words. There are free morphemes and bound morphemes. The bound morphemes act as affixes which combine with other morphemes to form inflectional and derivational categories.

Affixes can be realised in many ways. For example, past tense is realized with ić, ićić, ićić, φc, and ić and plural is realized with ę+c, ęće+c, ęče+c. These alternations are conditioned by the phonological properties of the surrounding sound segment of the affixes. However, morphotactic constraints which involve the ordering relations among morphemes are also effective in realisation of word forms. That is, affixes cannot be attached one after another in a free order. Thus in
designing language analysers, one should design and implement the mechanism that performs the phonological alternations and check the validity of ordering for the realisation of morphemes.

When adding a particular morpheme with another morpheme, the changes occurred depends not only on the characters but also on the type of the morpheme. In the following case, unless we know whether the first member of the given combination is a noun or a verb or something else, it may not be possible for us to predict the resultant form.

\[
\begin{align*}
\text{N} + \text{N} & \rightarrow \text{N} + \text{N} \\
\text{V} + \text{N} & \rightarrow \text{Not applicable} \\
\text{N} + \text{V} & \rightarrow \text{N} + \text{V} \text{ (Instrumental case)} \\
\text{V} + \text{V} & \rightarrow \text{V} + \text{V} \text{ (Conditional verb)}
\end{align*}
\]

Here, neither the phonemes nor the syllabic structure is responsible for the difference found in their sandhi behaviour. The factor which is responsible for the difference is the morphological structure, that is, the first one is of noun plus suffix type and the next one is verb plus suffix.

In Tamil, a noun is inflected for both number and case, the plural suffix is first added to the noun stem, optionally followed by the euphonic increment -in/-an, and then the case suffix is added. When a noun is inflected for case only, a case suffix is added to the stem or to the oblique stem, if any. When different types of suffixes are added to the noun, various morphophonemic rules operate.

When adding case suffixes to nouns, certain nouns undergo sound change. The Sandhi Rules describe which nouns undergo which changes. When a word that ends in a vowel and a suffix that begins in a vowel are added together, a glide - either \( \hat{u} \) or \( \hat{\omega} \) - is inserted in between. Selection of either \( \hat{u} \) or \( \hat{\omega} \) is determined based upon whether the final vowel is one of the 'front' vowels \( \text{i}, \text{u}, \text{a}, \text{e}, \) or \( \text{O} \), or one of the 'back' vowels \( \text{A}, \text{a}, \text{E}, \text{U}, \) or \( \text{V} \) respectively. Front vowels take the glide \( \hat{u} \) and back vowels take the glide \( \hat{\omega} \).

Words with the syllable structure CVC, nouns ending in \( \text{N} \), \( \text{M} \) and \( \text{M} \) undergo a number of different changes when a case suffix is added. Some case suffixes such as interrogative suffix, conjunctive suffix and the emphatic suffix (\( \text{A}, \text{U}, \text{M}, \text{V} \)) do not follow these rules. Some nouns ending with consonants with a syllable structure CVC where the vowel is short is added with any suffix, the final consonant is doubled.

Developing a rule based system to model these sandhi changes involves many complex linguistic rules. But, a supervised machine learning techniques can be used to develop such models from the sample data. The morphophonemic rules can be learned automatically from the examples given to the system. The following table 1 shows the types of sandhi changes on the given noun stems when case suffixes, adjective marker, adverbial marker and plural suffix are added.

### Table 1. Various noun inflections and plural forms

<table>
<thead>
<tr>
<th>Category</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Suffixes</td>
<td>( \hat{u} )-inserted</td>
<td>( \hat{\omega} )-inserted</td>
<td>Doubling</td>
</tr>
<tr>
<td>Nominative</td>
<td>NULL</td>
<td>( \text{N} )</td>
<td>( \text{V} )</td>
<td>( \text{N} )</td>
</tr>
<tr>
<td>Accusative</td>
<td>( \text{N} )</td>
<td>( \text{N} ) ( \text{N} )</td>
<td>( \text{N} ) ( \text{N} )</td>
<td>( \text{N} ) ( \text{N} )</td>
</tr>
<tr>
<td>Instrumental</td>
<td>-ஆல்</td>
<td>முழுகல்</td>
<td>படமல்</td>
<td>கல்லாரால்</td>
</tr>
<tr>
<td>-------------</td>
<td>-------</td>
<td>-----------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>Dative</td>
<td>-ட்டு</td>
<td>முழுகு</td>
<td>படம்கு</td>
<td>கல்லாருகு</td>
</tr>
<tr>
<td>Locative</td>
<td>-இல்</td>
<td>முழுகில்</td>
<td>படமில்</td>
<td>கல்லாரில்</td>
</tr>
<tr>
<td>Ablative</td>
<td>-இல்வுக்கு</td>
<td>முழுக்கு</td>
<td>படமுக்கு</td>
<td>கல்லாருக்கு</td>
</tr>
<tr>
<td>Sociative</td>
<td>-டல்/ டி</td>
<td>முழுவுல்</td>
<td>படமுல்</td>
<td>கல்லாரும்</td>
</tr>
<tr>
<td>Genitive</td>
<td>-இன்/இடொமங்</td>
<td>முழுகங்</td>
<td>படமங்</td>
<td>கல்லாரங்</td>
</tr>
<tr>
<td>Adjective</td>
<td>-ஆச</td>
<td>முழுகாச</td>
<td>படமாச</td>
<td>கல்லாசா</td>
</tr>
<tr>
<td>Adverb</td>
<td>-ஆ஑</td>
<td>முழுகா஑</td>
<td>படமா஑</td>
<td>கல்லா஑</td>
</tr>
<tr>
<td>Plural</td>
<td>-அள்</td>
<td>முழுகக் (7)</td>
<td>படமக் (9)</td>
<td>கல்லாகர் (7)</td>
</tr>
</tbody>
</table>

**Sample data**

<table>
<thead>
<tr>
<th>Class</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - ஒ-insertion</td>
<td>மழ + ஒ → மழமஒ</td>
</tr>
<tr>
<td>2 - ஒ-insertion</td>
<td>மக + ஒ → மகமஒ</td>
</tr>
<tr>
<td>3 Consonant Doubling</td>
<td>சல + ஒ → சலமஒ</td>
</tr>
<tr>
<td>4 -ம் inserted (-ம் removed)</td>
<td>மலம் + ஒ → மலமஒ</td>
</tr>
<tr>
<td>5 - ஒ deletion</td>
<td>விளங்க + ஒ → விளங்கக</td>
</tr>
<tr>
<td>6 - ஒ deletion, Doubling</td>
<td>கடி + ஒ → கடில</td>
</tr>
<tr>
<td>7 No change (Normal)</td>
<td>காம + ஒ → காமம</td>
</tr>
</tbody>
</table>

**Various plural forms of the given noun stems**

<table>
<thead>
<tr>
<th>Class</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Plural form 1 (No change)</td>
<td>மழ + கடம → மழகடம</td>
</tr>
<tr>
<td>8 Plural form 2</td>
<td>மலம + கடம → மலமகடம</td>
</tr>
<tr>
<td>9 Plural form 3</td>
<td>மக + கடம → மககடம</td>
</tr>
</tbody>
</table>
Feature representation

Different types of sandhi changes take place on different stem and suffix combinations. Training data is collected from the corpus for the above classes. The class numbers represent the type of sandhi changes. Maximum of 10 characters from the end of stem and 5 characters from suffix are used as nominal (symbolic) features. As the category of stem in this model is only noun, it is not specified as input explicitly. The class number is given as the output during training. The table 2 shows the feature vector for சர் + ற் and ஛஖ம் + ற் which belongs to output categories 6 and 8 respectively.

<table>
<thead>
<tr>
<th>Stem feature</th>
<th>Suffix Feature</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>க் ஆ</td>
<td>ட் உ</td>
<td>஍</td>
</tr>
<tr>
<td>க் ஆ</td>
<td>ட் உ</td>
<td>஍</td>
</tr>
</tbody>
</table>

The training data in the specified format is supplied to the decision tree classifier that is used to classify feature vector of the new words. The classifier generalizes from the training data. The output classes match the output of the rule based system. The decision tree learning algorithm was tested on a Java based WEKA open source machine learning tool.

Conclusion

The sandhi rules are important in word formation. An automatic sandhi checker or sandhi generator can be used as a critical component in morphological analyser, generator and text-to-speech synthesizer. In this paper we have presented an approach for a machine learning model which acts as a classifier to classify sandhi changes on noun inflections. Studying the capabilities of these types of algorithms on various word categories with different representation schemes are encouraging.
References:

Dependency Parser for Tamil classical literature- Kurunthokai

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Introduction

Dependency parsing is a form of syntactic parsing of natural language based on the theoretical tradition of dependency grammar [4]. It is a process of analyzing the dependency structure of a sentence. Tamil is always head-final language. The verb comes at the end of the clause with a typical word order of Subject Object Verb (SOV). However, Tamil language allows word order to be changed, making it a relatively word order free language. In Sangam literature poems the syntactic structure are more complex due to this relatively free word order nature of Tamil language. Dependency grammar is better suited for languages with free or flexible word order. Dependency parser for the contemporary Tamil language has been already developed [5]. This paper proposes a dependency parser for Tamil classical literature – Kurunthokai.

Kurunthokai

The Sangam literature contains about 50,000 lines of poetry contained in 2381 poems attributed to 473 poets including many women poets. ‘Kurunthokai’ is one of the eight anthologies (Ettuth thokai), which belongs to the Sangam age. It has 401 short poems of 6 to 8 lines, and written by 205 poets. The syntactic structure of the poem is very complex since many clauses are embedded in it. So, developing an automatic dependency parser for the Tamil classical literature- Kurunthokai will be a most wanted work of the modern era.

Architecture of the Proposed System:

The architecture of the proposed system is given below:

The proposed system contains three modules:

1. POS Tagger
2. Dependency Parser
Part-of-Speech Tagger: The Part of Speech (POS) tagging is done to obtain the labeled Part of Speech or other lexical class marker such as noun, verb, adjective, etc in the given verse.

Dependency parser: Dependency parsing is done to obtain the grammatical relation of the words in the verse. This decides which relations (subject, object, location, etc.) they have with the main verb or the root word. This is also used to obtain the types of clauses present in the verse.

Methodology of the proposed system

The methodology adopted to develop the modules is the Machine learning approach. Machine learning deals with techniques that allow computers automatically learn to make accurate predictions based on past observations. The major focus of machine learning research is to extract information from annotated data automatically, by computational and statistical methods. So the annotated data plays a key role in supervised machine learning techniques.

There are two main tasks involved in supervised machine learning; 1) learning or training, 2) Prediction. The system is trained with a set of examples called training data. The primary goal is to automatically acquire an effective and accurate model from the training data. This is a typical task for supervised learning and is usually called concept learning or learning from examples. The accuracy of the model will be better if the training data size is larger. The second phase of machine learning is the prediction, wherein a set of inputs is mapped into the corresponding target values, based on the generated model. The main challenge of machine learning is to create a model with high prediction accuracy. Here the training data will be generated for all the verses in the Kurunthokai, so the testing data will be of gold standard data.

POS Tagger

MBT (Memory Based Tagger) is an approach to POS tagging based on Memory-based learning. It is an extension of the classical k-Nearest Neighbor (k-NN) approach to statistical pattern classification. Here all instances are fully stored in memory and classification involves a pass along all stored instances. The approach is based on the assumption that reasoning is based on direct reuse of stored experiences rather than on the application of knowledge (such as rules or decision trees) abstracted from experience. Hence the tagging accuracy for known words will be cent percentage. As our test data will be of gold standard data and we use MBT for POS tagging the kurunthokai verse.

Customized POS tagset

The customized tagset contains 23 tags. We are not considering the inflections. The customized tagset is developed with the perspective of Tamil grammar Tholkappiyam [6]. The customized tagset with examples is given below Table (1).

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Main Category</th>
<th>Tag Category</th>
<th>Tag Set</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>சமுார்</td>
<td>சமுார் (Common Noun)</td>
<td>&lt;NN&gt;</td>
<td>மாமு</td>
</tr>
<tr>
<td>No.</td>
<td>Type</td>
<td>Tamil Word</td>
<td>Part of Speech</td>
<td>English Meaning</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>4.</td>
<td>Ṣமயம் பொருள் என்னம்</td>
<td>Interrogative Pronoun</td>
<td>&lt;PNI&gt;</td>
<td>மார்மா, மார்க்க, மார்க்கு</td>
</tr>
<tr>
<td>5.</td>
<td>பின்னு பொருள் என்னம்</td>
<td>Reflexive Pronoun</td>
<td>&lt;PNR&gt;</td>
<td>குறாம்</td>
</tr>
<tr>
<td>6.</td>
<td>கண்டறும் என்னம் (Numbers)</td>
<td>Cardinal</td>
<td>&lt;CRD&gt;</td>
<td>பதினு, 100, என்றானே</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>Ordinal</td>
<td>&lt;ORD&gt;</td>
<td>வளர்ச்சி, வளர்ச்சிக் கண்டறும்</td>
</tr>
<tr>
<td>8.</td>
<td>பொருள்</td>
<td>Finite Verb</td>
<td>&lt;VF&gt;</td>
<td>மாற்றக்கூடிய</td>
</tr>
<tr>
<td>9.</td>
<td>பொருள் மத்தாம்</td>
<td>Adverbial Participle</td>
<td>&lt;AVP&gt;</td>
<td>மாற்றம்</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>(Infinitive Participle)</td>
<td>&lt;IVP&gt;</td>
<td>மாற்றம்</td>
</tr>
<tr>
<td>11.</td>
<td>பண்புக்கையுள்ள என்னம் (Conditional Participle)</td>
<td>&lt;CVP&gt;</td>
<td>மாற்றக்கூடிய</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>பண்பு மத்தாம்</td>
<td>Adjectival Participle</td>
<td>&lt;AJP&gt;</td>
<td>மாற்றம்</td>
</tr>
<tr>
<td>13.</td>
<td>முதிர்தும் என்னம் (Gerundial Noun)</td>
<td>&lt;GN&gt;</td>
<td>மாற்றக்கூடிய</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>பண்புக்கையுள்ள என்னம் (Adjectival Noun)</td>
<td>&lt;AN&gt;</td>
<td>மாற்றம்</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>பின்னு பொருள் என்னம் (Participle)</td>
<td>&lt;PN&gt;</td>
<td>மாற்றக்கூடிய</td>
<td></td>
</tr>
</tbody>
</table>
Dependency Parser

Parsing is related to the automatic analysis of syntactic structure according to a grammar. It is usually performed after basic morpho-syntactic (POS) categories have been identified in a text. Dependency parsing is a form of syntactic parsing of natural language based on the theoretical tradition of dependency grammar. The dependency structure of the sentence is defined using dependency label and dependency head. Whenever two words are connected by a dependency relation, we say that one of them is the head and the other is the dependent, and that there is a link connecting them. In general, the dependent is in the form of modifier, object or complement. The head plays the larger role in determining the behavior of the pair.
In our proposed dependency parser system the representation the source of the edge represents the modifier and destination points to the head word. The customized dependency tagset contains 35 grammatical relations. MALT\(^1\) parser tool is used to obtain the dependency parser for kunthokai verse. An example of the data set is given below.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Word</th>
<th>POS tag</th>
<th>Depn arc</th>
<th>Depn tag</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>஝஧ட௑ம்</td>
<td>&lt;NN&gt;</td>
<td>2</td>
<td>&lt;CJ_SUB&gt;</td>
</tr>
<tr>
<td>2</td>
<td>ட௑ம்</td>
<td>&lt;NN&gt;</td>
<td>3</td>
<td>&lt;CL_SUB&gt;</td>
</tr>
<tr>
<td>3</td>
<td>மார</td>
<td>&lt;PNI&gt;</td>
<td>4</td>
<td>&lt;COP&gt;</td>
</tr>
<tr>
<td>4</td>
<td>வஞ஝ற்றாம்</td>
<td>&lt;VF&gt;</td>
<td>23</td>
<td>&lt;F_CL&gt;</td>
</tr>
<tr>
<td>5</td>
<td>சஞ்சஞடம்</td>
<td>&lt;NN&gt;</td>
<td>6</td>
<td>&lt;CL_SUB&gt;</td>
</tr>
<tr>
<td>6</td>
<td>ட௑மணடம்</td>
<td>&lt;NN&gt;</td>
<td>9</td>
<td>&lt;CL_SUB&gt;</td>
</tr>
<tr>
<td>7</td>
<td>மாம</td>
<td>&lt;PNI&gt;</td>
<td>8</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>8</td>
<td>நஞந்னேம்</td>
<td>&lt;NN&gt;</td>
<td>9</td>
<td>&lt;LOC_ATT&gt;</td>
</tr>
<tr>
<td>9</td>
<td>சஞ்சஞடம்</td>
<td>&lt;NN&gt;</td>
<td>23</td>
<td>&lt;F_CL&gt;</td>
</tr>
<tr>
<td>10</td>
<td>சைந்னேம்</td>
<td>&lt;PN&gt;</td>
<td>11</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>11</td>
<td>ட௑மவ்</td>
<td>&lt;PN&gt;</td>
<td>14</td>
<td>&lt;CL_SUB&gt;</td>
</tr>
<tr>
<td>12</td>
<td>மாம</td>
<td>&lt;PNI&gt;</td>
<td>13</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>13</td>
<td>மாம</td>
<td>&lt;NN&gt;</td>
<td>14</td>
<td>&lt;LOC_ATT&gt;</td>
</tr>
<tr>
<td>14</td>
<td>ட௑மணந்னந்னேம்</td>
<td>&lt;VF&gt;</td>
<td>23</td>
<td>&lt;F_CL&gt;</td>
</tr>
<tr>
<td>15</td>
<td>ட௑மந்ன்</td>
<td>&lt;ADJ&gt;</td>
<td>16</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>16</td>
<td>பஞ்னயம்</td>
<td>&lt;NN&gt;</td>
<td>18</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>17</td>
<td>ட௑மந்னந்னேம்</td>
<td>&lt;VN&gt;</td>
<td>18</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>18</td>
<td>ட௑மந்னந்ன்</td>
<td>&lt;NN&gt;</td>
<td>19</td>
<td>&lt;CL_SUB&gt;</td>
</tr>
<tr>
<td>19</td>
<td>ட௑மந்னந்னேம்</td>
<td>&lt;PPO&gt;</td>
<td>23</td>
<td>&lt;PP_CL&gt;</td>
</tr>
<tr>
<td>20</td>
<td>ட௑மந்னந்னந்</td>
<td>&lt;ADJ&gt;</td>
<td>21</td>
<td>&lt;ATT&gt;</td>
</tr>
<tr>
<td>21</td>
<td>ட௑மந்னந்னந்</td>
<td>&lt;NN&gt;</td>
<td>22</td>
<td>&lt;R_SUB&gt;</td>
</tr>
</tbody>
</table>

\(^1\)http://maltparser.org/userguide.html
Conclusion

MALT parser tool is language independent tool used for dependency parsing which is implemented for several languages. Using this tool the dependency labels and position of head in Tamil language is obtained.

References

POS tagging for Classical Tamil Texts

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Abstract

This paper presents a rule based model of Parts of Speech (POS) tagset for Classical Tamil Texts (CTT). The noun forms are Type pattern (a word form), verb forms are Lemmatization (grouping together all of the different inflected forms of the same word). This is based on form agreement method. This is a very efficient and novel approach because Tamil Language has a build-in system of agreement/concord in the sentence. Classical Tamil Tagset is divided into two basic classifications, namely noun morphology and verb morphology.

1. INTRODUCTION

There are a few POS Tagsets for Modern Tamil Language such as IL-ILMT, AU-KBC, IL-POST Microsoft, LDC-IL Mysore, etc. There are various methods in POS tagsets like linguistic rules, stochastic models and hybrid approaches, and each approach has its own merits and demerits (Rajendran. 2007). In this context, Classical Tamil further presents a challenge in developing an automatic POS tagger as the language is highly inflectional and morphologically rich. Hence, it is essential to consider text processing prior to POS tagging in order to achieve high performance and more reliability.

2. POS TAGGER FOR CLASSICAL TAMIL

To assign an appropriate Parts of Speech to a word in a sentence automatically this is our fundamental objective. Input as a string of word and an output as a single best tag for each word is provided in this model. Words are grouped together into classes (sets) which show similar syntactic behavior, often typical semantic type. Word categories are systematically related to morphological process. Significant amount of information about the word and its neighbors. The tagset consists of two broad subcategories, namely 1) closed class types (relatively fixed membership involving Determiners, Pronouns, Postpositions, conjunctions, Auxiliaries, Particles and Numerals), 2) open class types (relatively unfixed membership connected with Nouns, Verbs, adjectives and Adverbs).

3. BASIC IDEA OF THE POS TAGGING

The noun form carries plural marker, case markers, clitics, postposition, etc. The noun form may be a root or a stem or an oblique base form. The root form means that there is no future segmentation (kāl ‘leg’, kaṇ ‘eye’) and the base form means that the root word can be added with any suffix for example (kaṇṇaṉ (kaṇ + aṉ) ‘male person’, kuṟṟam (kuṟṟu-am) ‘hill’), the oblique means the form that carries a suffix or an equivalent to another form kiṇṇaṉ (kiṇṇu) ‘well’, āṟṟu (āṟu) ‘river’, eṉ (nāṉ) ‘I’, taṉ (tāṉ) ) ‘my’.

CLASSICAL TAMIL POS TAGS (50)

1. ADJ - Adjective
2. ADV - Adverb
3. CCD - Co-ordination
4. CCS - Subordination
5. DEA - Demonstrative Adjective
6. DEM - Demonstrative
7. DIA - Interrogative Adjective
8. DIN - Interrogative
9. DRF - Reflexive
10. MA – Accusative
3.1 Plural marker
Plural means a grammatical form that designates more than one of the things specified.

\[ \text{flower} + \text{MP} = \text{flowers} \]

3.2 Case markers
A case marker is a suffix, it occurs after noun and pronoun.

Accusative Case marker – இன் (iṁ), Instrumental case marker – க்கு (kku), Sociative case marker – ஏடு (ōṭu), Dative case marker – க்கு (kku), Genitive case marker – இன் (iṁ) and Locative case marker – ஑ண் (kaṇ).
3.3 Postpositions

A postposition is a word that occurs after noun which may or may not be an appendage to the case marker.

\[
\text{postposition} = \text{word + postposition}
\]

\[
\text{postposition} = \text{inside flower}
\]

\[
\text{postposition} = \text{before word}
\]

3.4 Vers

In general, a Tamil verb form takes tense marker along with person, number, gender markers (PNG). There are no multiple meaning features of tense markers and PNG markers. But it provides many conjugated forms of the verbs. It is well known that in almost all natural languages, verbs are considered to be the most important part of speech. Verbs play a very important role in languages. As Tamil verbs are inflected to various grammatical categories as distribution of the Tamil verbal base is necessary. In such a way, the verb forms consist of verb root and conjugations are classified. There are sixteen major types of verb conjugations as follows 1) Verbal Base (Vb), 2) Infinitive (Vinf), 3) Verbal Noun (non-past) (Vn), 4) Verbal Noun (past) (Vnp), 5) Verbal Participle (Vp) 6) Appellative Verbal Participle (Vpa), 7) Relative Participle (Vrp), 8) Appellative Relative Participle (Vrpa) 9) Conditional Participle (Vpc), 10) Participial Noun (Vpn), 11) Appellative Participial Noun (Vpna), 12) Verb Finite (Vf), 13) Appellative Verb Finite (Vfa), 14) Finite Participle (Vfp), 15) Auxiliary verb (Vax) and 16) Optative (Vop)

3.5 Adjectives (ADJ)

A word or phrase naming an attribute, added to or grammatically related to a noun to modify or describe it. There are two types of adjectives. They are inherent and derivative adjectives. Both are marked as single tag. Ex. எல்லா (ellā, pala)

3.6 Adverbs (ADV)

An adverb is a part of speech. It is a part of language verb, there are two types of adverbs. They are inherent and derivative adverbs. Both are marked as single tag (அங்கு, அங்கு வா (anku, āṅkam))

3.7 Pronouns (D)

A pronoun is a word that takes the place of a noun. (அணை, அணை (ava, avai))

3.8 Particles (P)

A particle is a function word that does not belong to any of the inflected grammatical word classes (such as nouns, pronouns, verbs, or articles). It is mostly used for words that help to encode grammatical categories (such as negation, mood or case), or fillers or discourse markers that facilitate discourse such as well, ah, anyway, etc. என்று, என்று (enru, enpatu)

3.9 Clitics (PCLI)

Clitics may belong to any grammatical category, though they are commonly determiners, or adpositions.

\[
\text{clitic} = \text{clitic}
\]

3.10 Numerals (N)

A numeral is a noun, divided into two types cardinal and ordinal. Both the types can be marked as a single tag (ஜ஠ர், ஜ஠ர் (ṉṟ, ṉṟu, ṉṟum, ṉṟavatu))

4. POS TAGGER PROCEDURE AND ARCHITECTURE

4.1 Procedure

POS Tagger has two tasks: Training task and tagging task. In the training task we have trained the validated tagged data into base-level training module. This module generates a database that validates the root word. It searches the form of the word in the root dictionary if it can find out the root dictionary it assign the appropriate tag, if it fails, it goes to the root dictionary in order to find out the rules of the suffix list to match the word. If the word is available, it assigns the appropriate tag and if it fails, it names it as an unknown category. The tagging process follows the following procedure.
4.2 Architecture of POS

The architecture of POS Tagger consists of three layers such as Data Layer (DL), Process Layer (BL) and Presentation Layer (PL). The system of architecture is shown below.

**Data Layer**

**Process Layer**

The Data layer is developed at the time of Training; it encapsulates all the information related to data from the tagging module like Electronic Text, Hyphenated text and Extensible Markup Language Database. The Process layer contains logic
for retrieving persistent data from the DL and placing it into process objects. The PL gives graphical user interface (GUI) application for end user application.

Input: A verse from the kuṟuntokai

Output: An annotated text

CONCLUSION

In significant part of the development of any Natural Language Processing system, Parts Of Speech system has to be framed. Tagged corpus is of basic resource for all NLP research. The Parts of Speech tagger is mainly used for Morphology analyzer, generator, Parser, etc., The tool provision category of the text is essential in this case. Ambiguities are common. To avoid such ambiguities, there is a need for syntactic and semantic information of a particular word. Hence POS for an analysis of Classical Tamil plays a major role in NLP.

REFERENCES

POS TAGGING FOR WSD IN TAMIL FOR COMPUTATIONAL ANALYSIS

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Introduction

Each and every language in the world has its own structure which is well constructed and well principled in terms of application as well as formation. It should be noted that there is no direct relationship between word and sense assignment, but in between there is some object orientation which helps in designate the sense. The lexical units are arranged according to the language specific contexts demands. Of course the language carries some common features. i.e. called universal ones.

Many words have more than one possible meaning. For example the word *aTi* have number of meanings, when it comes with tense marker it is a verb which means ‘to beat’. Similarly when it comes with case marker it is considered as a noun which means ‘foot of the leg, line of verse’ etc. After an infinitive of a verb, it serves as a causative marker and an auxiliary verb, used to indicate that the action in the main verb is executed with some harshness. Linguists discuss this phenomenon under multiple meaning and it proves to be complex. It can be seen that a word may have many meanings. Some of which are very different and some are related. Given these complications it is important for a computer which attempts language processing to be able to correctly determine the meaning in which a word is being used. The different meanings of polysemous and homophonous words are known as ‘sense’ and the process of deciding which is being used in a particular context “Word sense disambiguation”. WSD is regarded as one of the most interesting and longest standing problems in the analysis of languages.

POS tagging and WSD

Part of speech and sense tagging are similar operations. Both perform a type of lexical ambiguity resolution and each assigns a single tag to all or most of the words in a text. Word types for which each polysemous word has a distinct grammatical category associated with it. These words will always be disambiguated if its part of speech in a text is known. For example the contexts free situations where the information obtained from the base / root word as well as the suffix or case ending used with a word. This becomes useful because many inflected words in a language are added with particular sense after using class – specific suffix or case ending. Each of these types of information is potentially useful for disambiguating meaning be it manually or by computer.

In Tamil the words like *paTi, o:tu, o:TTu, na:Tu* etc. Can either be a noun or a verb in context free situation.

<table>
<thead>
<tr>
<th>Verb</th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>paTi</em> (to read)</td>
<td><em>paTi</em> (foot step/ measuring vessel)</td>
</tr>
<tr>
<td>paTitta:n</td>
<td>paTiyai</td>
</tr>
<tr>
<td>paTikkira:n</td>
<td>paTiya:l</td>
</tr>
<tr>
<td>paTippa:n</td>
<td>paTikku etc.</td>
</tr>
</tbody>
</table>

This can be demonstrated by considering the following sentences.

- **Surya a:Ra:m vakuppu paTikkira:n** (”Surya is studying sixth standard”)
- **ma:Tip paTiyil vilaiya:Da:te:** (Don’t play on the step”)
- **Sahana naTanam a:Tukira:l** (”Sahana is dancing”)
- **avan a:TTaip pa:rtta:n** (”He saw the goat”)

These words can be treated as a noun if a nominal case ending is tagged to it. Or they are verbs if a verbal suffix is tagged to it. Therefore these usages are disambiguated by their syntactic behaviour. This information source can be used for disambiguation when two meanings of a word have different parts of speech and the grammatical category of a particular usage can be determined.
It is difficult to determine the words which are only ending with nominal form or verbal suffix. These words will be disambiguated by only some part of speech assignment, and others will not be disambiguating without identifying the sense relations. Consider the following examples:

In Tamil the words like *athikaaram, alaku, iTam* etc., are multiple meaning words which are accepted only case marker. Similarly the words like *kaTTu, koTTu, aTI* etc are the forms considered as only verbs. Here part of speech is not useful to disambiguate the words. To disambiguate the words first we have to identify the textual meaning. Further on the basis of this concept we have to identify the sense on the basis of context.

Words convey certain references by implying the sense representation associated with its semantic implications. In fact the nature of a word in terms of semantic implicational coverage can be considered as direct and transferred. The transferred concept here refers to the suggestive meaning of a word, where as the direct refers to the etymological meaning of a word. This distinction mainly depends upon the semantic coverage related to the possible context in which a word can be used. If a word occurs in major /dominant context it will be considered as direct semantic nature, where as in the case of secondary (idiomatic) concept the word it occurs in more than one context. More over the meaning will be considered as static in the entire context, when the word functions a direct concept. In contrast the meaning assigned through the secondary concept varies from context to context.

Context to refer to an immediate linguistic environment (rarely detached or isolated) in which a particular word occurs. Since it is not always explicit, it may be hidden within the neighbouring members of a word used in a piece of text. If we cannot extract the information relevant to the meaning of a word from its immediate linguistic environment, we need to take into account the topic of discussion as a sphere of necessary information. Taking these factors into consideration, Context may have classified into three types: (a) Micro context (b) Transferred context and (c) Topical context.

**Micro Context**

The micro context refers to the immediate environment of the MMW in a sentence where it has occurred, surrounding its immediately preceding and succeeding words. Conceptually, the immediately preceding (i.e., left) word (LW1), the key word (MMW), and the immediately succeeding (i.e., right) word (RW1) (= LW1 + MMW + RW1) constitute a lexical block, where the MMW is the main member while the LW1 and the RW1 are supporting members. Systematic interpretation of the lexical block will supply necessary information to retrieve the contextual meaning of the MMW. The members of the lexical block generate a network of semantic relationship from which the intended meaning of the MMW is derived by integrating meanings provided by the LW1 and the RW1. Thus, in majority of cases, proper importance to the micro context will help us to obtain the actual meaning of the MMW. Within the sphere of structural semantics, it is a unique network of syntactically related members within which each member derives its meaning from the interface of its semantico-syntactic relation with other members. To examine how the micro context supplies information to understand the contextual meaning of the MMW, on experimental basis, I have used 4 sets of lexical blocks where I have put the MMW in the middle and one word in each side (±1) in the following manner (Figure 2). I have distributed the sample data set to Tamil speakers to examine if they can understand the contextual meaning of the MMW by associating meanings of the neighboring words without referring to the sentences. The informant is provided with only one set of data at a time in sequential order: [Set 1] > [Set 2] > [Set 3] > [Set 4].

![Figure 2 Position of MMW in the local context (LW = Left Word, RW = Right Word)](image)

The micro context provides us necessary information to know if the MMW holds relation with its neighboring members. A POS tagger assigns each word in a text to its word class. For example,
Puttakam paTikkira:n

“(He) reads book”

Surya a:Ra:m vakuppu paTikkira:n

“Surya is studying sixth standard”

aval paTyil pa:l koTutta:L

“She gave the milk in the measuring vessel”

In the above sentences the occurrence of the MMW (i.e., *paTI*) and RW1 (i.e., *pa:l*) as a lexical block within the micro context helps us to consider them together with a direct meaning, which is possible to derive if the words are treated separately in the sentence. Without further reference to any other context, we can understand that *paTI* is not used in general meaning.

Transferred context

The information obtained from this context is useful for understanding lexical collocation of words used in a lexical block. From here, we can know if co-occurrence of any two words is caused by choice (to evoke an intended sense) or by chance (having no special significance). I have found that association of two different words (W1 and W2) can denote a special meaning (idiomatic and/or metaphorical), which is not obtainable from the outline of individual literal meanings of the words. That means the co-occurrence of the W1 and the W2 in a particular lexical block can generate a special meaning, which is different from the literal meaning of each word. Moreover, collocation of the MMW with the new words generates new special meanings, which are different from the literal meaning of the words. Consider the following examples (Table 1)

<table>
<thead>
<tr>
<th>Neighboring Words</th>
<th>Literal Meaning</th>
<th>Special Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>eTu</td>
<td>to take</td>
<td>To take something with hand</td>
</tr>
<tr>
<td>tuNi etu</td>
<td>to take cloth</td>
<td>To buy the dress material</td>
</tr>
<tr>
<td>paNam eTu</td>
<td>to take money</td>
<td>Draw money from bank</td>
</tr>
<tr>
<td>taNNi eTu</td>
<td>take water</td>
<td>Collect water</td>
</tr>
<tr>
<td>V e:laikku a:L eTu</td>
<td>take the man for work</td>
<td>Recruit</td>
</tr>
<tr>
<td>Kaiyai eTu</td>
<td>to take hand</td>
<td>Remove the hand</td>
</tr>
</tbody>
</table>

Table 1 Variation of meaning due to lexical collocation of words

Topical Context
The topical context refers to the topic of discussion and focuses on the content of a piece of text. Quite often, it is found that the actual meaning of the MMW depends heavily on the topic which has a strong role to alter etymological meaning of the MMW. The following examples can show that the event of meaning variation of the MMW takes place due to variation of topic or content—a regular phenomenon noted in all natural languages. It also implies that we should extract relevant information from the topic to trail the change of meaning of the MMW.

1. *caTTai paccai niRamaaka irukkiRatu* (“The shirt is green in colour”)
2. *nam paccai mi:nai ca:ppiTa muTiya:tu* (“we can’t eat raw / uncooked fish”)
3. *paccai maNNil pommai ceyyala:m* (“We can make the toy with wet clay”)
4. *paccai piLLai pa:l kutikkitu* (“Young baby drinking milk”)
5. *avan paccaiya:ka pe:cuva:n* ("He used unparliamentarily words")

If we analyze the above sentences independently, we shall find that the MMWs (paccai) do not have any notable variation in meaning. But if we combine all the sentences with context together and analyze, we can easily extract a special meaning of the MMW. Taken together, the sentences display a network of meanings, which is not obtainable from individual sentences. Here, special meaning is possible to extract only when we refer to the topic and interpret the sentences with close reference to the topic of the text.

**Conclusion**

Thus identification of suffix marker or case ending often helps to categories a word to particular lexical class and sense with reference to its context of use. But, if we find that information obtained from the context free situation is not sufficient for understanding sense variation. In linguistics a word has a bundle of information related to phonology, morphology, lexicology, semantics, syntax, text, grammar, etymology, metaphor, discourse, pragmatics and the world knowledge. It is not easy to capture all the information of a word just by looking at its surface form or to its orthography. We require a versatile system along with our native language intuition to interpret all the possible explicit and implicit meanings of a word used in a text for computational analysis.

**References**

Morphological Analyzer for Classical Tamil Texts: 
A Rule-based approach for Case Marker

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Abstract

This paper describes the works to build a Morphological Analyzer for Classical Tamil using Rule-based approach. Morphology is the study of internal structure of the word. Morphological analysis is a process of segmenting words into morphemes and a process of analyzing the word formation. Morphological analyzer is a tool for any type of Natural Language Processing work. It is a computer program which takes words as input and produces its grammatical structure as output. It identifies and segments the words and assigns the grammatical information. Capturing the agglutinative structure of Tamil words by an automatic system is a challenging job. This paper is going to reveal a rule-based approach for case marker.

Introduction

Natural Language Processing (NLP) is a computerized approach to analyze the text based on a set of theories and set of technologies. And, being a very active area of research and development, the basic objective of Natural Language Processing is to facilitate human-machine interaction through the means of natural human language.

Morphological analysis of a word is the process of segmenting the word into component morphemes and assigning the correct morphosyntactic information. For a given word, a morphological analyzer (MA) will return its word and the word class along with the other grammatical information depending upon its word class. MA returns all possible parse for a given word, without considering the context. MA is a very essential for languages having rich inflectional and derivational morphology such as morphologically rich languages like Dravidian languages.

Morphological Analyzer is a vital tool in NLP applications. In morphological rich languages, as there are multiple affixation, the finer grammatical information which helps in building efficient NLP applications, can be obtained only from Morphological Analyzer. Morphological Analyzer is required in most of the applications such as information extraction, QA system, machine translation and spell checker. There are several approaches attempted for Morphology for Tamil, We present a methodology for morphological analysis of Tamil, a morphologically rich, in this paper. We present a rule-based method for Morphology for Classical Tamil, particularly case marker.

Tamil morphology

Tamil belongs to the Dravidian family of languages. It is one of the Classical Languages. It is a verb-final language and has a relatively free word order; it is an inflectional language. Agglutination is another feature of the language. Tamil morphology is characterized as agglutinative or concatenative, i.e., Words are formed by successfully adding suffixes to the root word in series. When suffixes attach to the root several morphophonemic changes take place. The orders in which suffixes attach to a root form determine the morphosyntax of the language and the various changes that take place when a suffix attaches are called the morphophonemics.

Challenges in Morphological Analyzer for Classical Tamil

Tamil is a classical language which belongs to the Dravidian language family. Tamil literature has existed for over two-thousand years. The morphological structure of Classical Tamil is quite complex since it inflects to person, gender, and
number markings and also combines with auxiliaries that indicate aspect, mood, causation, attitude etc in verbs. A single verb root can inflect for more than two-thousand word forms including auxiliaries. Noun root inflects with plural, oblique, case, postpositions and clitics. A single noun root can inflect for more than five hundred word forms including postpositions. The root and morphemes have to be identified and tagged for further language processing at word level. The structure of verbal complex is unique and capturing this complexity in a machine analyzable and generatable format is a challenging job. The formation of the verbal complex involves arrangement of the verbal units and the interpretation of their combinatory meaning. Phonology also plays its part in the formation of verbal complex in terms of morphophonemic or sandhi rules which account for the shape changes due to inflection.

Methodology

Finite State Automata (FSA)

FSA is a model of behavior composed of a finite number of states and transitions between these states. FSA is an abstract device used for recognizing simple syntactic structures or patterns. An automata is normally depicted by directed graph, called State Diagram and it is also represented in a tabular form as State Table. An FSA, as a string processing device, accepts strings as input and decides if the structure is correct, that is, it either accepts or rejects the string. From a mathematical perspective it is regarded as a function, mapping a set of string to the set (Accept, Reject).

Case Marker

Case system links a noun phrase and other parts of the sentence through inflection markers, or a word which may be called as a adposition including preposition and postposition

1. Object case (-ai)

   eyilai - eyil + ai

2. Instrumental case (-oṭu)

   kotiyōtu - koti + oṭu

3. Associative case (ku, -kku, -akku, -ukku)

4. Dative case (iṅ)

   karumpiṅku - karumpu + iṅ + ku, cāttāṅku - cāttā + ku
   maturaiṅku - maturai + (k) ku, tamakku - tam + akku
   avaṇukku - avaṇ + ukku

5. Genitive case (-atu)

   el|atukuppai - el + atu + kuppai, paṭaiyatukulām - paṭai + atu + kulām

6. Locative case (-kāṅ)

   poruṭkāṅ - poruļ + kāṅ, malarkkāṅ - malar + kāṅ
7. Nominative case (0)

Rules for Case Markers

Rule 1: Case suffix

The morphosyntax of case suffix may be summarized as

Root + {ai} {āl} {iṅ} {ku} {kku} {akku} {ukku} {atu} {kaṇ}

a) After segment the case marker, if remaining word end with consonant later add ‘-u’.

The following example illustrate the inflection of a case suffix of ‘iṅ’

\( aṅpīṅ → \) check the root word dictionary

\( aṅp + \{iṅ\} (\text{if ‘no’ remove the suffix } iṅ) \)

\( aṅp + \{iṅ\} (\text{add ‘u’ at the end of the root word}, aṅpu + iṅ) \)

The following example illustrate the inflection of a case suffix of ‘il’

\( eḻuttīl → \) check the root word dictionary

\( eḻutt + \{il\} (\text{if ‘no’ remove the suffix } il), \)

\( eḻutt + \{il\} (\text{add ‘u’ at the end of the root word}, eḻuttu + il) \)

b) Case suffix for ai, Remove the suffix ‘ai’, Check for root word dictionary

If yes print result, If no remove (y /n) case marker, Check for root word dictionary

If yes print result

Ex. tōliyai \( → tōlīy ai \) {remove the suffix ai}

tōlīy [check dictionary / no word]

tōli y {remove y the last phoneme} = tōli + y + ai {Result}

c) To split a suffix from the word. The word consists of double letters between words and suffix namely n, l, l, n which are segmented separately.

\( \text{(kaṇ, kal, col, taṇ)} \)

Ex. kāṇukku \( → kāṇ + u + ukku, kālukku \rightarrow kāl + l + ukku, collukku \rightarrow col + l + ukku \)

taṇṇai \( → taṇ + n + ai \)

Analysis

The morphological analysis identifies root and suffixes of a word. Generally rule-based approaches are used for morphological analysis which are based on a set of rules and dictionary that contains root words and morphemes. In rule-based approach, a particular word is given as an input to the morphological analyzer and if that corresponding morpheme
or root word is missing in the dictionary then the rule-based system fails. Here each rule depended on the previous rule. So if one rule fails, it affects the entire rule that follows. In the course of testing of the rule, certain inconsistencies and lapses in recognizing certain word, First have been found nineteen thousand and nine hundred Classical Tamil root word corpus has been taken for analysis of that corpus is applied the case markers rules. The careful appraisal and study of the words is conducted to identify and overcome the lapses by incorporating certain amount of data into the root word to enhance the coverage and the overall performance of the morphological tools. The following problems are also well noted

1. Some words end with y (āu) and v (āv) which is a part of the word. Do not operate their Sandhi rules. For examples aṅcāy, kāy, pāy, vāy and tev.

2. In some words which require the doubling of the end consonant before add the suffix. For example kānna (kān+ṇ+ai), mānna (mān+ṇ+ai) tammai (tam+m+ai), emmāi (em+m+ai) collai (col+l+ai), pallai (pal+l+ai) neyya (ney+y+ai), mēyya (mey+y+ai) pōṇṇa (pōn+n+ai), viṇṇa (viṇ+n+ai)

3. Moreover -u (ṭu and ru) adding rule is a role between word and suffix. Here it is doubling the final consonant after removing the case marker. If the check before the dictionary For example nāṭṭai (nāṭṭ-ai), viṭṭai (viṭṭ+ai), āṭṭai (āṭṭ-ai), kūṭṭai (kūṭṭ-ai)

4. -u adding rule plays an important role between word and suffix. Here doubling of a variant consonant occurs after removing the case marker. For example māṟpāi (māṟp+ai), cāḷpāi (cāḷp+ai)

Conclusion

This paper has described the Morphological Analyzer for Classical Tamil rule-based approach; in this paper rule-based approach is applied for Case marker. These rule-based approaches for case markers produce the result with more accuracy. In future, using the approach we can develop a rule-based approach for the analyzing not only case markers but also other markers and grammatical variations.

Reference

AgriQC- A NOVEL QUESTION CLASSIFICATION SYSTEM FOR AGRICULTURAL KNOWLEDGE MANAGEMENT SYSTEM IN TAMIL

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ABSTRACT

The technologies of the “Knowledge Age” are transforming our focal point from personal, secluded information systems and repositories to a wide exchange and sharing of information in order to widen the size and depth of knowledge available to an individual.

The availability of such a kind of sharable knowledge is possible with the help of a Knowledge Management System (KMS). To access knowledge from the knowledgebase of a KMS, a user can query the system through a query processing subsystem of the KMS. The system in turn should provide accurate, relevant and consistent information to the user. The accuracy of the information depends not only on the technical intricacies in designing the knowledge retrieval subsystem but also in the intelligence the subsystem should possess in analysing the query submitted by the user, so as to retrieve relevant information from relevant sources. Thus it is very important that some machine learning techniques be adapted to analyse and classify the queries. A good classification system improves the overall performance of the KMS. This paper deals with the classification of queries for the Agricultural Knowledge Management System (AgriKMS) developed in Tamil.

Developing a question classification system for an AgriKMS in Tamil is a complex task. AgriQuestion Classification (AgriQC) helps in minimizing search space by analysing the Tamil language queries and generating the appropriate structured query to be submitted to the knowledge retrieval system. Machine learning approach is adopted for the AgriQC so that it provides important clues for answer selection and extraction. The design of a classifier and the extraction of the candidate features are the two key issues to be tackled in the AgriQC. Four features namely subordinate word category, question focus, syntactic and semantic structure are used for feature extraction.

The feature set is then used for classifying the questions given by the agriculturists to the AgriQC system. This system thereby acts as a sub system of an agricultural knowledge management system whose goal is to collect knowledge from experts in agricultural domain, unstructured and semi structured knowledge from www and social community sites and to disseminate knowledge to the end users by answering their queries using the AgriQC.

1. Introduction

Knowledge services can be otherwise called knowledge management activities are, the activities like creation, access, transfer and application of knowledge. From management perspective it is clear that these activities involve a heterogeneous group of people or entities working on the knowledge and therefore requires a consistent and reliable service. Therefore these activities must be governed and controlled by a management system.

A KMS (Knowledge Management System) refers to an information technology-based system to support and assist communities in knowledge management activities. To provide these services a basic Knowledge Management System consists of a knowledge retrieval module, knowledge extraction module, knowledge updation module and knowledge transfer module. This complicated task requires the storing of information in a structured Knowledge base which provides the needed infrastructure for a variety of knowledge services.

This knowledge base plays a vital role in the knowledge management system. It is a repository of domain specific information managed by the knowledge management system.
Thus a KMS is not a mere knowledge distribution system, but rather an interactive and open work environment. Of the number of user groups like knowledge creators, updaters, modifiers another major group interacting with the system is a group questioning the system for retrieval of information in their natural language. The question answering system, a module of the knowledge retrieval system should manage the user queries, select a correct answer from several candidates and provides exact answers for the query since a single query may be reformulated in different ways.

Question classification (QC) provides important clues for answer selection and extraction and hence a good QC system improves performance of the overall QA system. QC helps in minimizing search space by generating the appropriate queries to the information retrieval system. The natural reasoning system is capable of differentiating and indentifying queries posed to it and accordingly returns the expected answer. It handles the task with no difficulty and this process is termed as the human cognition. But it is difficult indeed to introduce this reasoning process within a machine which is still under research. Query framing differs from user to user. Processing queries of varied types appearing in different formats is a bottleneck to a machine. It is a hard task developing a question answering system which will produce exact answers in natural language. The difficulty of pinpointing and verifying the precise answer makes question answering more challenging than the common information retrieval task done by search engines.

This research attempts to provide insights into the following issue:

How should agricultural related questions in Tamil be classified in the question answering systems with relation to the type of answer sought?

The remaining part of this paper is organized as follows. Section 2 describes the different approaches being used for QC. Section 3 explains our original work for AgrilQC in Tamil. In Section 4 we conclude this work.

2. Literature Survey

The difficulty of Natural Language Processing (NLP) has limited the ability of a question answering system to give accurate answer to questions that are quite specific to a particular domain.

MULDER is claimed to be the first general-purpose, fully automated question-answering system available on the web. MULDER’s architecture, relies on multiple search-engine queries, natural-language parsing, and a novel voting procedure to yield reliable answers. However, the difficulty of Natural Language Processing (NLP) has limited their ability to give accurate answer to questions that are quite specific to a domain. In addition to the traditional difficulties associated with syntactic analysis, there remains many other problems to be solved, e.g., semantic interpretation, ambiguity resolution, discourse modelling, inference, common sense, etc[14].

In order to avoid a number of difficulties in developing QA systems, a candidate set of question are generated automatically by analysing the sentences present in the selected documents. The question-answering system architecture basically uses sentences within a document as a source of question/answer[3].

Praveen Kumar et al [7] discuss about a question answering system that extracts domain specific keywords from the question and converts it into a query. This query is given as input to the search engine which retrieves relevant documents from the web after weighing and ranking them. Case based classification method is used to classify question types. They claim that this classification methodology helps in the later part of answer selection to put selectional restrictions to check which candidate answers satisfy the semantic constraints [7].

Q/A system based on knowledge base finds the most similar answer-sentence with the target question from the knowledge base and then return the corresponding answer to the user, the retrieval mode of which fully takes advantage of the large-scale of texts, and also avoids bringing the error resources in, which is a very good retrieval mode [5].

The prior knowledge of the estimated answer type helps the QAS to extract correct and precise answers from the document collection[2].
Emanuela Moreale and Maria Vargas [1] use argumentation for finding answers in the specific domain of student essays. The argumentation categories are obtained by means of bottom up approach: categories being definition, reporting, positioning, strategy, problem, link, content/expected, connectors and general. The query classification phase involves processing the query to identify the category of answer that the user is seeking[1].

Works (Hovy et al. 2001; Moldovan et al. 2002; Roth et al. 2002) have shown that locating an accurate answer hinges on first filtering out a wide range of candidates based on some categorization of answer types given a question. Specifically, this classification task has two purposes. First, it provides constraints on the answer types that allow further processing to precisely locate and verify the answer. Second, it provides information that downstream processes may use in determining answer selection strategies that may be answer type specific.[11].

3. AgriQC – A Novel Question Classification System

The AgriQA (Agricultural Question Answering System) requires both context based retrieval of information and inferencing of knowledge. People questioning the system may be of mixed type; both educated and uneducated. The research is oriented towards both the category taken into consideration.

In this section we concentrate on the Agricultural Query Processing Module, a submodule of the AgriQA, the technical details required for it’s implementation. The work is organised and approached as follow: a. Challenges in Analysing a question in Tamil; b. question classification strategy; c. the features to be extracted discussed.

3.1 Agricultural Query Processing Module

The query processing module for the agricultural domain involves processing of simple and complex queries. The feature set includes namely subordinate word category, question focus, syntactic and semantic structure. Unlike simple questions, complex questions cannot be answered by simply extracting named entities. These questions require inferencing and synthesizing information from many sources.

3.2 Challenges in Analysing a question in Tamil

3.2.1 Position of the question tag

Usually when a question is raised, the question tag is analyzed first. Based on the question tag the next level of analysis continue. In English the question tag usually appears as the first word in the question. This helps in chunking the question for the question tag initially and based on this it is easier to classify the questions. But in Tamil the position of a question tag is usually present at the end or in the middle and may also vary. For eg

 onDestroy உள்ள்லில் உள்ளே உள்ளல் உள்ளல்?
 உண்டை உள்ளே உள்ளல் உள்ளல் உள்ளல்?
 உன்றுக்கு கூறுகை என்று என்று என்று என்று என்று?
 என்று என்று என்று என்று என்று என்று?
 என்று என்று என்று என்று என்று?

And also the question tag helps for further identifying the answer type in the AgriQA system.

3.2.2 Question characteristics namely lexical, syntactical and semantics play a major role in the classification of questions.

Extraction of syntactic and semantic information usually requires language-specific tools. Tools, such as parsers, are not well suited for processing questions since they are trained on a corpora that don’t contain many questions [4]. The relatively simple bag-of-word approaches that are successfully used in text retrieval are not sufficient for extracting specific, fact-based answers in an AgriQA system. It requires linguistic processing ranging from the relatively simple pattern matching and lexical look-up tables to the more difficult analysis of syntactic and semantic structure. Natural language processing techniques like shallow parsing, named entity recognition, part-of-speech tagging and logical transformations [9] are required.
3.3 Question Classification Strategy

A novel strategy, in addition to conventional search and NLP techniques, is used to construct the AgriQC system. We took a set of questions in Tamil in the domain. The questions are largely factual, requiring a listing, descriptive answers. We manually classified them into four classes as listed below and are supported with suitable examples. Since no standard set of categories exists in the domain, we chose a rather coarse set that seemed appropriate to us.

**Named Entity (animal, people, thing)**

- மேலால் குறிப்பிட்டு குறிப்பிட்டு நேர்வியலாக சான்றாக்கும் முயற்சி முயற்சி முயற்சி முயற்சி?
- மேலால் குறிப்பிட்டு குறிப்பிட்டு நேர்வியலாக சான்றாக்கும் முயற்சி?

**Location (city, country)**

- மேலால் குறிப்பிட்டு குறிப்பிட்டு நேர்வியலாக சான்றாக்கும் முயற்சி?
- மேலால் குறிப்பிட்டு குறிப்பிட்டு நேர்வியலாக சான்றாக்கும் முயற்சி?
- மேலால் குறிப்பிட்டு குறிப்பிட்டு நேர்வியலாக சான்றாக்கும் முயற்சி?

**Description (definition, description, manner, reason)**

- **Definitions**

  The question tag what (எனது) helps in retrieving a description of the entity searched for eg. ஊடு ஛஝நர் எனது?

- **Explanation**

  ஊடு ஛஝நர் எனது

- **Manner**

  ஊடு ஛஝நர் எனது

- **List**

  ஊடு ஛஝நர் எனது

- **Numeric**

  ஊடு ஛஝நர் எனது

- **Seasonal**

  ஊடு ஛஝நர் எனது

- **Order**

  ஊடு ஛஝நர் எனது
The question types can further be classified as low order and high order and can be either closed-ended (convergent) or open-ended (divergent) depending upon the type of answer they return [10]. A low order question requires the system to simply recall a simple single fact. On the other hand a high order question expects the system to recall facts and simultaneously show that they understand the topic, situation or solution to a stated problem. In otherwords, a high order question will expect that a system should understand the relationship between a fact or piece of knowledge within the greater context of the situation.

Closed-ended questions requires factual data that are generally short, while divergent type of questions requires an ability to recall some information from stored memory, but must apply that knowledge and other knowledge to explain, extrapolate or further analyze a topic, situation or problem[10].

**Feature to be extracted**

In *linguistics*, subordination is a principle of the hierarchical organization of linguistic units. The principle is applicable in semantics, syntax, morphology, and phonology and most work in linguistics use the term "subordination" in the context of syntax. Thus to put it in a nutshell "Subordination is a relation existing between two syntactic units, whereby one unit is subordinate to the other and the latter is superordinate to the former"[13].

The relationship can be represented as a syntactic structure by trees. Trees are used for exhibiting constituency and dependency structure. Dependency grammar focuses on syntactic dependencies.

The analysis of an agricultural question posed by a user revealed the free word order. Thus dependency structures is well suited for the language. The example below shows a dependency tree, an ordered tree i.e. it shows actual word order.
Conclusion

The aim of the Agricultural question classification system is to analyse the query posed by an user to the system and retrieve the apt answer expected by the user. We discussed some of the methods used in the existing QA system and proposed a new strategy suitable for the agricultural domain. In the query processing module we have discussed about the difficulties involved in processing a query in tamil language, identification of question types, subordinate word feature extraction which will further help in the retrieval of the exact answer and the dependency structure suitable for the language.
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Topic E

Natural Language Processing

தினமல்ல விளக்க ஆய்வு
TAMIL NOUN TO SIGN LANGUAGE
A MACHINE TRANSLATION APPROACH

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ABSTRACT

This paper focuses on a novel automatic machine translation system for translating Tamil noun words into sign language variants. Noun words generally do not contain a generic meaning or predefined sign, so a special method has to be designed for translating Tamil noun words to sign gestures in sign language. Two methods are followed in representing nouns words in sign language. Namely finger spelling approach and Air writing approach. This work explores a novel approach of translating Tamil noun words to sign gestures using finger spelling approach to sign gesture. Finger spelling is an act of spelling out alphabets with the help of fingers and fingers displacement. Finger alignment for each letter is represented using a Dactylology chart. The final outcome of the proposed system is hand animated sequences of letters in Tamil noun words.

1. INTRODUCTION ON SIGN LANGUAGE

Sign language is the native language for hearing impaired people and is not universal. It varies slightly from region to region just like dialects of a spoken language. A single sign can have different meaning in different sign language. For example same sign is interpreted as “slow” in SriLankan sign language and “easy” in American sign language (ASL).

To overcome the communication barrier between hearing impaired and normal hearing community an automatic machine translation will be very useful. There are various machine translation systems being developed to translate spoken language text to native sign language. Some of the systems are especially developed to be used in particular domains such as in banking hall, weather forecasting, in post offices by the hearing impaired community[3]. A complete and full fledged system that translate spoken text to Sign language is not yet developed and only little work is carried out in translating Tamil text to Tamil sign language.

A machine translation system has to bridge the structure of sign language ie the usage of the hand movements, palm orientation, fingers (manual) and body, facial expression (non manual) on one side to the grammar of spoken language on the other side, since the structure of Sign language is different from the spoken language and there is huge lexical gap between them. Therefore reordering of signs is needed to convey the correct meaning.

Usually the sentence of the spoken language may contain noun, verbs, adjectives, tenses, and numbers. More care should be taken to represent them in sign language. Tenses, temporal aspects and verbs are signed in different position in signing space and emotional words are signed through facial expressions[4][5]. Word sense disambiguation issues in sign translation systems can be overcome by contextual models. In the case of proper noun there is a need to apply a different approach in translation process. The objective of the proposed system is to translate nouns in Tamil text to Tamil sign language in an effective manner.

Generally in sign language, nouns and proper nouns are signed by Finger spelling and Air writing method. The Air Writing is an approach where with the help of the fingers the signer will draw the alphabetic representation in the air. This means that structure of the alphabets is shown in air. The important aspects in Air writing method is that the signer must correctly, perfectly and accurately show the alphabet orientation.

Though Air writing method is simple to represent the alphabets it has the following drawbacks: It depends on the signer speed in representing the alphabet, knowledge of the signer about the alphabet structure; as it vary among individual and focus of the recipient. These constraints/drawbacks can be overcome by a better and robust method namely Finger
spelling method. It is mostly used to represent the noun words in sign language. The proposed approach deals with the Finger spelling representation of Tamil noun words.

This paper is organized as follows section II discusses on various machine translation approaches used in sign language translation systems. Section III deals with the finger spelling concepts. Section IV dealt with system architecture and its working and Section V is about evaluations of the system and section IV about the conclusion and further enhancement of the system.

2. SIGN LANGUAGE TRANSLATION SYSTEM

Various methods are followed in general to translate spoken text to native sign language. The machine translation methods are classified as Example based method[6], direct transfer method and Interlingua method. In example based method initially a set of sentences in spoken language is translated manually into sign sequences and stored. With the help of this repository, the translation process is carried out. Direct translation method is based on word-byword translation[7]. Each spoken language word is mapped onto a sign. Simple reordering rule is applied to get the sign sequences. The system is limited to the availability of signs and sign-word mapping. In Interlingua Approach the source language text is initially analyzed and converted into some abstract meaning representation, called an Interlingua. Then sign language is then generated from the Interlingua representation. All these methods depend on the morphological aspects of the spoken language.

In these methods tagger and parser are used to identify the nouns, verbs, adjectives tenses, plurals, genders, named entities and other parts of speech. Apart from tagger and parser, word net dictionary is also used. Nouns and proper noun words will occur in the sentence in different forms. It is a challenge for a translation system to identify the noun words which occur in a sentence in different forms. The noun can be name of a person, name of a place or can be referred as he, him and by using POS tagger, dictionary and anaphora resolution techniques these words can be identified, then these words are tokenized into individual letters and these letters are represented using finger spelling method.

3. FINGER SPELLING APPROACH

One of the approaches that are used in sign language to communicate is the Finger Spelling which is the representation of letters by using only hands which are the basic units of sign language. As there are no proper and specific signs for noun words Finger spelling method is used to represent noun words in sign language. It also helps native Tamil speakers.

In the finger spelling approach the nouns are first tokenized into individual letters. Then based on the way the letter is written symbols are assigned to them using dactylology chart. Tamil letters have circular shapes; partially due to the fact that they were originally carved with needles on palm leaves, a technology that favored rounded shapes. The writing of a Tamil is a combination of alphabetical and syllabic systems. Tamil has twelve vowels, eighteen consonants, four Grantha consonants (‘ʤ’, ‘ṉ’, ‘ṇ’ and ‘ṉ’) and one special charter ‘ஃ’. Table I shows an example the Tamil Finger Spelling based on dactylology chart for the word “உஜ஧”.

TABLE I Tamil letter mapping based on dactylology chart.
Dactylology chart gives gesture representation for each Tamil letter in sign language using hand movements. Figure 1.2 denotes the finger spelling which is representing letter ‘ஓ’, which is a vowel in Tamil language. In Tamil finger spelling, left hand is dominated by the right hand. Right hand makes alternative gestures to represent each Tamil letter.

Moreover, as shown in figure 3.1 right hand travels through each finger of left hand to represent vowels. Another most important point is that, these finger spellings should be made within the human body range, which means within a shoulder range. All Five Tamil vowel letters (‘ஆ’, ‘ஐ’, ‘ஈ’, ‘ஊ’, ‘ஓ’) has exploit finger movement.

4. SYSTEM ARCHITECTURE OVERVIEW

The proposed system architecture for translating Tamil noun words to Tamil sign sequences is shown in fig 4.1. The architecture of the Tamil noun words to Tamil sign language translation system is essentially a pipeline of three stages namely Reader, Planner and Hand Animator. Initially noun words are identified using tagger and Tamil dictionary after which the noun words are separated and are given as input to the reader. The reader along with help of the dactylology chart[9] maps the signs and this is sent to the planner where the Hand movements are fixed and in the hand animator module the sign sequence for the noun word is generated and finally animated in 2D screen[2][8].

A.Text preprocessing

The given Tamil sentences are preprocessed with the help of Word net dictionary and anaphora resolution techniques to identify noun words. Then these words are given as input to the Reader.

B.Reader

The Reader takes Tamil Noun words as input. Using Tokenizer (uyirmei algorithm) the given noun word is separated into individual letters or Tokens. These tokens are classified into uyir (அ..), mei (ம்) and uyirmei (ஜ定点) letters. This algorithm takes into account the Unicode of the character and accordingly identifies the uyir and mei letters and with the help of this the uyirmei letters are generated. Then the symbols are generated from the symbol predefined chart namely Dactylology chart.
The sign representation of each letter or alphabet of Tamil language set is available in the dactylography chart. Another important task performed in this module is the identification of the sign for uyirmei letters. These letters formed from both uyir and mei characters. Though there are two character representations for uyirmei while generating the signs for these letters it should be a single step and this issue is taken care by the planner.

### C. Planner

In planner the characters are checked whether they are kuril or nedil character which is most important in determining the Hand animation. The tokens or letter along with their signs are fed into the planner. The kuril and nedil characters are identified and depending on this the hand gestures are generated. If there are kuril characters then the display is a static gesture and nedil characters then the display is dynamic gesture. In static gesture the right hand just touches the left hand. Whereas in dynamic gesture the right hand makes movement on the fingers of left hand. The output of this module is given to Hand animator to animate the sign sequence.

### Hand Animator

This is the last module in the system where the signs for the noun words are animated. The animated signs are sequenced and are displayed on a GUI for effective understanding by hearing impaired people. Fig 4.2 shows the output screen for a word. In this depending on the kuril and nedil characters the gestures are generated.

![Figure 4.2 Hand Animator](image)

### 5. EVALUATION CRITERIA

The elevation is done based on precision and recall. To the example presented the precision and recall graph is obtained as shown in the figure 5.1 both are calculated using the formula each letter Precision=TP/TP+FP, Recall= TP/TP + FN For a... precision= 1/1+3= 0.25= 25%, Recall= 1/1+4= 0.2 =20%. Similarly for the remaining characters the precision and recall are calculated for our example.

### 6. CONCLUSION
The proposed work is synthesis of Tamil Sign Language gesture for Tamil noun words. The complexity is reducing in the process, instead of determining uyir-mei characters as uyir and mei separately, we can create a single image. This reduces both the time complexity and space complexity. At present sign gestures has created only for Tamil nouns words, Later it can be emphasized for the verb, tense, etc. Tamil Signs were developed by using the Dactylology chart. In future, individual character or written form of uyir mei characters can be synthesized based on Regular Expression and by generating the grammar. The system can also be developed to synthesize the common noun.

REFERENCES

Development of Telugu-Tamil Bidirectional Machine Translation System: A special focus on case divergence

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Abstract

Each case marker has a number of functions which lead to case mismatches in machine translation (MT). Hence, any effort in the direct mapping of case markings often results in non-standard or ungrammatical constructions in the target language. In detail, this paper attempts to find out the divergent functions of the nominative, accusative and dative case markers between Telugu and Tamil and provides various solutions to handle them in Transfer Based MT system.

1. Introduction

Building a machine translation (MT) system is one of the challenging tasks in Natural Language Processing. Even though Tamil and Telugu are two closely related languages belonging to Dravidian language family, still they exhibit a considerable amount of diversity at every level viz. morphological, syntactic, semantic and lexical levels. Keeping these in mind, building a MT system for this language pair can be not only non-trivial but also challenging. The paper deals with the issues in the development of an automatic Telugu-Tamil bidirectional MT systems.

To build a more sophisticated and effective MT system, it is significant to identify divergences (i.e. cross linguistic differences) between the pair of languages. This paper focuses on case divergences i.e. the differences that occur due to case selection in Telugu and Tamil.

2. Case mismatches

Case is a system of marking dependent nouns for the type of relationship they bear to their heads (Blake, 1994:1). In certain cases, languages show a great mismatch in the patterning of the morphological case against the patterning of the syntactic case. It arises due to the distinction of a case (form) and its grammatical role (function) that it expresses.

Case marking with nominals in Telugu and Tamil is exhibited as suffixes to express the different syntactico-semantic functions. The inflection of case is overtly marked except in the case of Nominative which is Ø in both the languages as in Table-1.

<table>
<thead>
<tr>
<th>Language</th>
<th>NOM</th>
<th>ACC</th>
<th>DAT</th>
<th>INST</th>
<th>ASS</th>
<th>LOC</th>
<th>ABL</th>
<th>GEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamil</td>
<td>Ø</td>
<td>-ai-</td>
<td>(u) kku/-āl</td>
<td>-ātu/-il/-iliruntu/-iŋ/-uṭaiya/</td>
<td>uṭaŋ</td>
<td>-iṭam</td>
<td>-iṭamiruntu</td>
<td>-atu</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-ku</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telugu</td>
<td>Ø</td>
<td>-ni/-ki/</td>
<td>-tō -tō -lō/</td>
<td>-nuMdi/-yokka</td>
<td>-nuMdi/-yokka</td>
<td>-doggara</td>
<td>-nuMci/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-nu</td>
<td>-ku</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-1: Case System of Telugu and Tamil

2. Machine Translation systems discussed here are being developed under the project of IL-IL MT at CALTS, University of Hyderabad, as a part of the Consortium of Indian Languages to Indian languages Machine Translation Systems funded by DIT, Ministry of Information Technology, Govt of India.
Here are some of the major reasons for case mismatches between Telugu and Tamil.

1. Case Syncretism
2. Case with Complements to Postposition

3. Case Syncretism

Case syncretism occurs when a single inflected form corresponds to two or more case functions (Comrie 1991: 44-47). Distinct case values are determined on a language-specific basis, so that the case syncretism by the definition involves an observable asymmetry between paradigms within a language (Bearman, 2009:219).

Both in Telugu and Tamil, a number of instances of case syncretism are found and that poses problems in MT. Here, we list the divergent behaviour of the use of the nominative, accusative and dative case markers between Telugu and Tamil.

3.1 Nominative Case Marker

Nouns in the nominative case have different functions such as (i) subject, (ii) predicate, (iii) subject complement, (iv) object complement and (v) object (Lehmann, 1989:25).

3.1.1 Subject: The nominative case marked noun is used as a subject in both Telugu and Tamil. When a subject is in the nominative case, it controls verb agreement.

(1) Te. rāmuḍu, ikkaḍi-ki vacc-ā-ḍu,.

Ram.NOM here-DAT come-PST-3SGM

Ta. rāmaṛ, inkkē va-nt-āq,.

Ram.NOM here come-PST-3SGM

'Ram came here'

However, when a predicate indicates the capabilitative mood, Tamil optionally uses the subject inflected for the instrumental case marker or otherwise called as inflected for the lexical passive (Subbarao & Bhaskararao, 2004:163), whereas the subject in Telugu is in the nominative case.

(2) Te. nēnu i pani ceyy-a-gala-nu

I.NOM this work-Ø (ACC) do-INF-can-1SG

Ta. enn-āl/nāṅ inta vēlai.y-a.i.c ceyy-a-muṭi-y.um.

I-INST/I.NOM this work-ACC do-inf-can-3SGN (default)

'I can do this work'

3.1.2 Predicate: Noun phrases in their predicate position occur in the nominative case in Tamil. In Telugu, the predicate nominals are in the oblique case agreeing in person and number with the subject when it is in the first or second person singular or in the first person plural. Such agreement is manifested by the occurrence of a pronominal suffix which is co-indexed with the subject.3

(A) Predicate noun:

---

3 The addition of pronominal suffix with a noun is otherwise called pronominalized noun (Krishnamurti and Gwynn, 1985:134)
In Telugu, abstract nouns of quality with adjectival force occur in the position of a predicate in equative [NP-NP] construction [Krishnamurti and Gwynn, 1985:p125]. These nouns do not show agreement with subject and are in nominative form and similar to Tamil. The nouns like poVdugu 'tall', eVwwu 'height', etc., do not agree with the subject.

(6) Te.nēnu mī-kaMṭē pōdugu
I.NOM you.PL-than tall (noun) .Ø
Ta.nāg uṅkal-ai viṭa uyaram
I.NOM you.PL-ACC than tall (noun) .Ø
'I am taller than you'

(8) Te.mēmu muggura-mu.
we.excl.NOM three person.OBL-1PL
Ta.nāṅkal mūvar.

<table>
<thead>
<tr>
<th>With first person singular</th>
<th>With first person plural</th>
<th>With second person singular</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) Te. nēnu yuvakuḍi-ni .</td>
<td>(4) Te. manamu yuvakula-mu.</td>
<td>(5) Te.nuvvu yuvakudi-vi.</td>
</tr>
<tr>
<td>I.NOM young man.OBL-1SG.</td>
<td>we.incl.NOM young man.OBL-1PL.</td>
<td>You.NOM young man.OBL-2SG.</td>
</tr>
<tr>
<td>I.NOM young man.Ø</td>
<td>we.incl.NOM young man-PL.Ø</td>
<td>You.NOM young man.Ø</td>
</tr>
<tr>
<td>'I am a young man'</td>
<td>'We are young men'</td>
<td>'You are a young man'</td>
</tr>
</tbody>
</table>

(7) Te.nēnu maMciṭṭi-ni.
I.NOM good person.OBL-1SG
Ta.nāṅ nalla/vaṇ.
I.NOM good person .Ø
'I am a good person'

(C) Predicate Numeral: A Predicate numeral is the number expression that occurs in the predicate position. The numerals in predicate position function exactly like predicate nouns in terms of agreement in Telugu. Hence, they appear in oblique form.

(8) Te.mēmu mugguru-mu.
we.excl.NOM three person.OBL-1PL
Ta.nāṅkaḷ mūvaṇ.
we.excl.NOM three person.Ø

'We are three persons.'

3.1.3 Subject Complement: The nominative case is used in Tamil when a noun functions as a complement to the subject with a verbal predicate. Similar to predicate nouns, the subject in Telugu agrees with the subject complement when it is in the first or second person singular or in the first person plural.

(9) Te.nēnu, maMciwādi-ni, ayy-ā-ну.
'I.NOM good man.OBL-1SG become-PST-1SG'

Ta.nāṇ, nallavan, ōṇēṇi
'I.NOM good man.Ø become-PST-1, sg'

'I became a good man'

3.1.4 Object Complement: The noun must be in the nominative case when it functions as an object complement in Tamil. In such cases, Telugu noun is marked for accusative case. Irrespective of the ontology of object, the accusative case marker is mandatorily assigned to the object and its complement object in Telugu as in (10).

(10) Te.nēnu vāḍi-ni rāyī-ni/ maniRī-ni cēs-ā-nu.
'I.NOM stone-ACC/ human- ACC do- PST- 1SG

Ta.nāṇ avaṇ-ai kal/ maṇitaṇ ākk-īṇ-ēṇ
'I he- ACC stone.Ø / human.Ø make-PST- 1SG

'I made him into a stone/a human'

3.1.5 Object: The noun may be in the nominative case when it functions as an object which is [-animate] and [-specified] both in Telugu and Tamil.

(11) Te.nēnu pāṭa pāḍ-ā-nu
'I.NOM song Ø (ACC) sing- PST- 1SG

Ta.nāṇ pāṭṭu pāṭ-īṇ-ēṇ.
'I.NOM song.Ø (ACC) sing-PST-1SG

'I sang a song'

3.2 Accusative Case Marker: The direct object of a transitive verb is accusative case marked either overtly or covertly. In both the languages, the accusative case marker shows syncretism with the nominative case marker (Ø) when the direct object marker is not overtly case marked.

The major divergence on marking accusative arises due to the following reasons between Telugu and Tamil:

1. Differential Object Marking
2. Accusative Case Marking of Theme in the Non-nominative Subject (NNS) Construction
3.2.1 Differential Object Marking

The variation in the occurrence of case marking with direct object is termed as Differential Object Marking (DOM) (Bossong 1991, Comrie 1989, Aissen 2003, Subbarao 2012 amongst others). DOM depends on the direct object’s ontological properties. The higher one in the scale is more prominent and tends to be marked by the accusative case. This can be shown in the following scalar dimensions.

Definiteness scale: [+pronoun] > [+proper noun] > [+definite] > [-definite, +specific] > [-specific]

Animacy scale: [+human] > [-human, +animate] > [-animate]

The animacy and definite hierarchy are applied to find out the divergent behaviour of DOM in Telugu and Tamil. The major divergence in the usage of the accusative case marker between Telugu and Tamil occurs with the object which is [+human], [+pronoun, -human, +/- animate] and [+definite, -animate].

(i) Nouns [+human]: Both in Telugu and Tamil, human nouns on the definiteness scale are obligatorily marked for the accusative case. However, in certain cases in Tamil, the accusative case suffix is used optionally with the object noun (O) [+human] as in (12) whereas Telugu uses it obligatorily.

(12) Ta.kumār māppillai- (y.ai.t) tēṭu-kīc-āṅ.

KumAr son-in-law- (ACC) search-PRS- 3SGM. (Lehmann, 1988:p29)

Te.kumāru allaḍi-ni vetuku-tunn-āḍu.

KumAr son-in-law- ACC search- PROG- 3SGM

“Kumar is looking for a son-in-law.”

The absence of accusative case in (12) indicates that the object noun is incorporated into the verb and forms a complex predicate.

(ii) Nouns [+pronoun, -human, +/- animate]: In Tamil, the object [+pronoun, -human, +/-animate] is marked accusative obligatorily” whereas in Telugu it is optional. Though pronouns [+deictic] and [+proper] are definite and referential [Bossong, p160:1991], Telugu has an option to mark the pronouns [-human, +/-animate] with the accusative case suffix as in (13). The pronoun idi 'it.prox (imal) ’/ adi ’it.dist (al) ’ can be used as referential to nouns [-human, +animate] (eg. dog) and nouns [-animate] (eg. computer) in Telugu and correspondingly itu/atu in Tamil.

(13) Te.nēnu idi cūs-ā-nu.

I it see-PST-1SG

Ta.nāg it-ai.p pār-tt-ēṅ.

I it-ACC see-PST-1SG

'I saw this'

---

4 Our corpus data (CALTS Corpus with 3 million data) show that they are 84 cases in which the DO is accusative marked in contrast to 3 cases where it is not accusative marked; Since there are only 3 cases statistically it is considered as insignificant.
The pronouns *it.prox* and *it.dist* may also refer to nouns that are [+human, +female]. In such cases, intimacy or derogatoriness of the subject towards the direct object is indicated. Here, the accusative case suffix is used obligatorily as in (3), since the pronoun [+human] has a higher status in the animacy scale.

(14) Te. *nēnu ēni-ni cūs-ā-nu*

*I she/it-ACC see-pst-1SG

'I saw her/this'

(iii) Nouns [+definite, -animate]: In Tamil, when a direct object[-ani] is modified by definite modifiers such as determiners (15) and possessives (16), the presence of accusative case is obligatory in contrast to Telugu where it is optional.

<table>
<thead>
<tr>
<th>(15) Ta. <em>vēlu en</em> *vītu /vīṭ-ai.p pār-tt-āŋ..</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velu.NOM my *house.NOM/house- ACC see-PST-3SGM</td>
</tr>
<tr>
<td>Te.vēlu nā ili/āMṭi-ni cūs-ā-ḍu</td>
</tr>
<tr>
<td>Velu.NOM my house.NOM/house- ACC see- pst-3SGM</td>
</tr>
</tbody>
</table>

'(Velu saw my house'.

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Velu that *house/house- ACC see-PST-3SGM</td>
</tr>
<tr>
<td>Te.vēlu ā ili /āMṭi-ni cūs-ā-ḍu.</td>
</tr>
<tr>
<td>Velu that house/house- ACC see-PST-3SGM</td>
</tr>
</tbody>
</table>

'(Velu saw that house'.

3.2.2 The Accusative Case Marking of Theme in Non-nominative Subject Construction (NNS)

Dative Subject Construction is the most widespread in Dravidian (Subbarao, 2012:p134) . The dative marked subject acts as an experiencer subject and the verb agrees with the object. In Tamil, stative predicates expressing the notion of mental and emotional experiences require the case marking pattern of DAT-ACC (Lehmann, 1989: p180) and DAT-NOM in Telugu. Verbs such as *weVri* 'know' and *puri* 'understand' and etc., in Tamil and *weVlusu* 'know' and *arWamavvu* 'understand' and etc., in Telugu refer to some mental experience as in (17) . Verbs such as *piti* 'like' and etc., in Tamil and *naccu* 'like' and etc., in Telugu express the emotional experience as in (18) .

<table>
<thead>
<tr>
<th>(17) Ta. *eṇ-akku avan-ai.t teriyum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I- DAT he- ACC know.3SGN (default)</td>
</tr>
<tr>
<td>Te. nā-ku vāḍu telusu.</td>
</tr>
<tr>
<td>I- DAT he.NOM know.3SGN (default)</td>
</tr>
</tbody>
</table>

'I know him'

<table>
<thead>
<tr>
<th>(18) Ta. *eṇ-akku uṇṇ-ai.p piṭi-kk-um</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-DAT you-ACC like-FUT-3SGN (default)</td>
</tr>
<tr>
<td>Te. nā-ku nuvvu, nacc-ā-vu,</td>
</tr>
<tr>
<td>I- DAT you.NOM like-FUT-2SG</td>
</tr>
</tbody>
</table>

'You pleased me (lit.) / I like you'

3.3. Dative Case Marker:

The dative case marker in Telugu and Tamil has a wide range of functions and it is marked with the nouns expressing beneficiary, goal, the experiencer subject, purpose, possession, point in time and place, comparison, distribution and etc. (cf. Ramarao, 1975; Krishnamurti and Gwynn 1984; Ramanarasimham, 2006, Paramasivam, 1983:151 as quoted by
Lehmann, 1989:31; Arden 1942, Subbarao, 2012). However, there are lots of instances where the dative has divergent functions and cannot be directly mapped between Telugu and Tamil.

3.3.1 Location: Nouns of inanimate category when inflected for the dative in Telugu express possession or appropriately the locative function. On the contrary, Tamil uses the locative marker. Here, the dative case marker relates two noun phrases which have holonymy-meronymy relationship. The word which is holonymy is marked for the dative case marker in Telugu and the locative in Tamil. Example:

(19) Te. gōḍa-ku kitiği uM-di.

wall-DAT window be-PRS.3SGN

Ta. cuwaṛ-c-il jappal iru-kkir-atu.

wall-LOC window be-PRS.3SGN

The wall has a window.

3.3.2 Direction: The dative marked noun can express the direction in Telugu. The swapping of dative marker is found between Telugu and Tamil and thus named as dative swapping which is marked as a configurational difference between them. We use dative swapping to refer to the exchange of the dative between the postposition and their complement Ns in the translated structures. In Telugu, a noun (N) followed by a Spatial Noun (which functions as postposition (P)) inflects for dative, whereas in Tamil the complement noun receives dative. It can be illustrated as in the following:

Te. ( ([N][P]) +DAT ) <= Ta. ( ([N]+DAT/GEN) [P])

For instance, the following examples explicate the dative swapping between Telugu and Tamil.

(i) Direction towards inside/outside, up/down, forward/backward of a place: Place nouns occurring with the complements of P denoting the motion towards inside/outside, up/down and forward/backward inflects for the dative in Tamil and in the swapping order in Telugu.

(20) Te. kumār iMṭi lō-ki/lōpall-ki veḷḷ-ā-du.

'Kumar house inside-DAT/inside-DAT go-PST-3SGM

Ta. kumār vīṭṭu-kku ullē ce-ṇṭ-ṇṭ.

'Kumar house-DAT inside go-PST-3SGM

Kumar went inside the house.

(ii) Direction towards left side/right side/ the point of compass: Place nouns occurring with the complements of P denoting the motion towards leftside/rightside (21) and the point of compass (22) inflect for the dative in Telugu and Tamil. Optionally, the dative swapping is also observed in Telugu.

(21) Te. a. rāmuḍu iMṭi-ki kuḍivaipu vēḷḷ-ā-du.

Ram house- DAT leftside go-PST-3SGM

b. rāmuḍu iMṭi kuḍivaipu-ku vēḷḷ-ā-du.

Ram house.OBL leftside-DAT go-PST-3SGM

(22) Te. a. mā iMṭi uttarāṇi-ki/paḍamaṭi-ki veḷḷ-ā-nu

our house.OBL north-DAT/west-DAT go-PST-1SG

b. mā iMṭi-ki uttaraM/paḍamaṭa vēḷḷ-ā-nu.

my house-DAT north / west go-PST-1SG

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(iii) Direction towards a place: Both in Telugu and Tamil, nouns denoting place inflect for dative directly when they occur as complements of verbs of motion. However, non-place nouns when occur as complements of nouns denoting space i.e. locative nouns do not inflect for dative but the locative head inflects for dative. But in Tamil, both place (22) and non-place nouns (23) occurring as complements of locative nouns inflect for dative.

<table>
<thead>
<tr>
<th>Telugu</th>
<th>Tamil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ram house-DAT leftside go-PST-3SGM</td>
<td>our house-DAT LOC/west-DAT go-PST-3SGN</td>
</tr>
<tr>
<td>‘Ram goes to the left side of the house’</td>
<td>‘I went to the north/west side of our home’.</td>
</tr>
</tbody>
</table>

However, nouns inflected for dative can be complements of verbs of motion in Tamil, but these complements have postpositions as their heads. Whereas in the case of Telugu it permits nouns to be complements of postpositions inflected for dative.

(iv) Direction towards Nouns of space of generic type: Nouns of space of generic type like in Telugu *akkaḍa* 'there', *ikkaḍa* 'here', etc., when inflect for the dative indicate direction, whereas the corresponding forms in Tamil do not require the dative. In Tamil, these generic space nouns have the -e marker which shows the direction as in *aṅkē* 'there', *inḵē* 'here', *ullē* 'inside', *veli.yē* 'outside', and etc., Example:

<table>
<thead>
<tr>
<th>Telugu</th>
<th>Tamil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raja there-DAT go-PST-3SGM</td>
<td>Kumar immediately Raj-DAT/Raj-GEN near-LOC go-PST-3SGM</td>
</tr>
<tr>
<td>‘Raja there go-PST-3SGM</td>
<td>Immediately, Kumar went near Raj.</td>
</tr>
</tbody>
</table>

3.3.3 Duration: The dative here refers to the use of it as the expression of specific time. Sometimes it is realized as obligatorily in Tamil, whereas in Telugu, it is not.

(i) Duration of time (within X, where X is a temporal noun): The Tamil noun marked for dative case expresses a specific time limit or duration of time roughly equivalent to the English ‘within’.

<table>
<thead>
<tr>
<th>Telugu</th>
<th>Tamil</th>
</tr>
</thead>
</table>
Te.nā-ku padi rōju-la lōpu/logā pustakaM ivv-aMdī.

I-DAT ten day-PL inside book.Ø (ACC) give-imp[ hon]'

'Give me the book within ten days.'

(ii) Temporal Specification (within X, where X is a temporal noun): Certain nouns like nēṟṟu 'yesterday', iṉṟu 'today' and nāḷai 'tomorrow' take dative case in Tamil whereas Telugu does not (26). Whenever Telugu uses the dative with these nouns (27) to indicate 'by X', where X is a temporal noun.

(26) Ta. nāḷai/nāḷai- kkū varu-v-ēṉ.
I tomorrow/tomorrow-DAT come-FUT-1SG

Te. nēnu répu vas-tā- nu.
I tomorrow come-FUT-1SG

'I will come tomorrow.'

(27) Ta. nāḷai-kkū varu-v-ēṉ.
I tomorrow-DAT come-FUT-1SG

Te. nēnu répaṭi-kī vas-tā- nu. I tomorrow-DAT come-FUT-1SG

'I will come by tomorrow.'

(iii) The period of time: A noun of the period of time with the verb [+motion] takes the locative case marker to express the time in Tamil and Telugu. Telugu uses the dative with these nouns (29) to indicate 'by X', where X is a period of time.

(28) Te. nēnu udayaM/udayā-na vas-tā- nu.
I morning/morning-LOC come-FUT-1SG

Ta. nāḷ kālai.y-il varu-v-ēṉ.
I morning-LOC come-FUT-1SG

'I will come in the morning'

(29) Te. nēnu udayāni-ki vas-tā- nu.
I morning-DAT come-FUT-1SG

Ta. nāḷ kālai.y-il varu-v-ēṉ.
I morning-LOC come-FUT-1SG

'I will come by morning'

(iv) Limitation of time: To express the limitation of time, Tamil marks the noun with the dative marker and Telugu nouns is in the nominative case.

(30) Te. nēnu ikkaḍa iMkā remḍu saMvatsarā- lū uM- tā- nu.
I here more two year-PL.NOM be-FUT-1SG

I here more two year-DAT be-FUT-1SG

'I will be here for two more years.'

3.3.4 Distribution: The dative inflected noun in Telugu and Tamil exhibit distributive sense. Telugu inflects with the dative in the second part of the reduplicated noun to show the distributiveness. Whereas, in Tamil the first part of the noun is inflected for dative to express the same. The following examples illustrate the dative with noun[-animate] as in (31) and [+animate] as in (32).
(31) Te.iMṭi iMṭi-ki ceṭ-lu peMcu-dā-M. house.OBL house-DAT tree-pl grow-FUT-2PL

(32) Te.manSi manSi-ki tēdā uM-di. human.OBL human-dat difference be-PRS.3SGN

Ta.vīṭ-ukku vīṭu maram valar-pp-ōm. house-DAT house.Ø tree.Ø grow-FUT-2PL

Ta.maṭīta-ukku maṭītaṇ vēṟupāṭu ʊl-1-atu. 'Each human has a difference.'

3.3.5 Standard of Comparison: While comparing two noun phrases, the standard of comparison in Tamil is expressed by the marking of the dative case, whereas the Telugu noun is marked for the associative and optionally the dative case.

(33) Te.nuvvu nā-tō/ nā-ku samānaM you.NOM I-SOC/I-DAT equal

Ta.nī en-akku.c camam you.NOM I-DAT equal

'you are equal to me'

3.3.6 With verbs of reach, belong to and touch: The arguments of verbs such as reach (34), belong to (35) and touch (36) require the dative marking in Telugu and the accusative marking in Tamil.

(34) Te. iMṭi-ki cērukonn-ā-v-ā? house-DAT reach-PST-2SG-INTR

Ta. viṭṭ-ai cēnāṭai-nt-āy-ā? house-ACC reach-PST-2SG-INTR

'Did you reach home?'

(35) Te. vāḍu japān-ku ceMd-ina-vāḍu. he.NOM Japan-DAT belong-PST-ADJ_PART-3SGM

Ta. aṇaṇ japaṇ-ai.c cēr-nta-vān. he Japan-ACC belong-PST-ADJ_PART-3SGM

'He belongs to Japan'

(36) Te.nā illu nadi-ki ānukan-i uM-di. my house.Ø river-DAT touch-CPM be.HAB-3SGN

Ta.en viṭu nadi.y-ai oṭṭ-i iru-kkič-ātu. my house.Ø river-ACC touch-CPM be.HAB-3SGN

'My house is located close to river'

4. Case Assigned By Postpositions:

There are postpositions in both languages, which assign case to their complements (noun phrase) which is morphologically manifested. For instance, consider the following example, where nōkkī 'towards' in Tamil assigns
accusative to the right to the NP that is governed, whereas the corresponding PP in Telugu assigns an oblique case.

Example:

(37) Te.kumār nī kēsi vell-ā-du.
Kumar you.OBL towards-DAT go-PST-3SGM

Ta.kumār unū-ai nōkki.p pō-ŋ-āŋ.
Kumar you-ACC towards go-PST-3SGM

'Kumar went towards you.'

The other examples are,

TeluguTamilMeaning

N NOM + tappaN ACC + tavira 'except'
N OBL+ lāMtiN ACC + pōl/pōla 'like'
N OBL + guriMciN ACC + kurittu 'about'
N ACC + baṭṭiN GEN + pati 'accordingly' and etc.,

5. Conclusion

Though Telugu and Tamil are genetically related languages, the above case distributions demonstrate that there are lots of divergences between which poses problems in MT. The divergence due to case mismatches are the major ones that should be tackled systematically in any Machine Translation system. Our Machine Translation system handles these types of cross-linguistic variations by formulating appropriate rules in Transfer Grammar which ensures the better output in MT.

References


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ABSTRACT

The aim of this work is handling complex sentences and alignments of words. Hybrid Machine Translation is automatically acquires knowledge from large amounts of training data at different languages. The system is to translate complex sentence structures to process able chunks and translating the text English to Tamil. The system is first separates the source text word by word with POS category and searches for their corresponding target words in the bilingual dictionary. Rule Based Reordering, Morphological Analyzing, and dictionary based translation to the Target language. The transfer rules for reordering from English parse tree with respect to Tamil help us to get the output in the syntactic pattern of target language. The reordered output after morphological generation of Tamil words is displayed as the final output of the machine translation system and then errors in the translated sentences are corrected by applying Statistical technique.

1. INTRODUCTION

Machine Translation is a process of translating the sentences from one language to the other based on the information in the Knowledge Base without human intervention. There are three approaches to machine translation: Statistical, Example based and Rule based machine translation systems. Synchronous Tree Adjoining Grammar associated aligned tree/string training data and a method of converting these grammars to a weakly equivalent tree transducer for decoding.

Natural Language Processing is a theoretically motivated range of computational techniques for analyzing and representing naturally occurring texts at one or more levels of linguistic analysis for the purpose of achieving human-like language processing for a range of tasks or applications. Also, the contents of the documents that are being searched will be represented at all their levels of meaning so that a true match between need and response can be found, no matter how either are expressed in their surface form. There is typically a well-defined problem setting, a standard metric for evaluating the task, standard corpora on which the task can be evaluated, and competitions devoted to the specific task.

In earlier years the machine translation is done only at the word level i.e. word by word translation. This project is carried out at many places for years but still need of a good translation system. Any basic translation requires two main view points: First is the linguistic point of view and second is the mathematical point of view. The three major techniques involved machine translations are [1] Rule Based, Statistical, and Example Based Technique. The Statistical and Example Based Techniques needs parallel corpora for translation. In such cases adopting only the statistical technique will not result in proper translation to the target language.

2. SYSTEM FEATURES

A Hybrid technique is developed for a system that generates simple sentences translation with part of speech tagging, chunking and morphological generator, segmentation is done. The preprocessing tool for machine translation that simplifies the complex sentences into simple sentences. This system uses rule based technique for sentence simplification and uses characters such as (,, "", "?.") as delimiters for sentence separation. They have designed this system as a preprocessing tool for English to Tamil translation.

Hybrid machine translation (HMT) is leverages the strengths of statistical and rule-based translation methodologies. Several MT companies (Asia Online and Systran) are claiming to have a hybrid approach using both rules and statistics. The approaches differ in a number of ways: Rules post-processed by statics: Translations are performed using a rules based engine. Statistics are then used in an attempt to adjust/correct the output from the rules engine. Statistics guided by rules: Rules are used to pre-process data in an attempt to better guide the statistical engine. Rules are also used to
post-process the statistical output to perform functions such as normalization. This approach has a lot more power, flexibility and control when translating.

3. CURRENT WORK

The given source sentence is parsed and tagged using POS tagger, the tagged information is stored in a separate file. The rule based reordering of the sentence has to be done in the above formulated order using the tagged information. Chunking of the source sentence has to be done using the bi-gram model, and the bi-grams are translated into Tamil language by means of a word dictionary file. Then the word by word translation has to be done with the bilingual dictionary and if a word does not exist in dictionary, it may be a proper noun which is to be transliterated to Tamil language. Then apply gender ending rules to get the target output sentence. The error in the target sentence is corrected statistically using the file which contains collection of Tamil verbs with proper tense and gender endings. Finally the Tamil sentence for the corresponding English sentence is generated.

4. SYSTEM METHODOLOGY

This paper presents an effective methodology for English to Tamil translation. Hybrid Machine Translation is handled by mapping from input to output sentence. Input is the English sentence which is enriched with segmentation, parsing and bilingual dictionary information. Output is a Tamil sentence with statistical error correction. The purpose is to group sequences of words are translated from source sentence to target sentence using hybrid techniques. The system can be translating complex sentences by creating new morphological reordering rules. Since a word in English has multiple meaning in Tamil, an effective word dictionary file (4500 words from English to Tamil) is used in order to achieve better results in translation. Gender ending verbs for all possible tenses were created for the purpose of statistically correcting the errors in the output sentences.

4.1 HMT Process

The process is acquires knowledge from training data and also enhance the input text with POS tagging and morphological information. After applying the local word grouping rules to the Tamil sentence (s), based on their four methods to process and align. (1) Dictionary lookup approach (DL) is used verbs and other groups are processed with DL
approach; HWGs with categories such as proper nouns, city, job-title, location, and country are processed with TS approach. (2) **Transliteration Similarity** is transliteration system maintains a consistent correspondence between the alphabets of two languages, irrespective of sound. Given two words, each from a different language, we define “transliteration similarity” as the measure of likeness between them. This could exist due to the word in one language being inherited or adopted by the other language, or because the word is a proper noun. Named entities such as city, job-title, location, country and proper nouns, all recognized by the local word grouping algorithm are compared using a transliteration similarity approach.

Neighbors approach works on this principle and aligns one or more words with one of the English words. Considering one HWG at a time, we find the nearest Tamil word that is already aligned with one or more English word(s). We assume that the words in English-Tamil phrases follow a similar order and align the rest words in that group accordingly. The algorithm retrieves expected English word(s) from the HWGs and tries to locate them in the English sentence. This approach can be useful to locate one or more English words that align with one or more Tamil words.

**INPUT**

Ravi waited for the train but the train was late.

**OUTPUT**

Segmentation and Tagging

The segmentation and tagging of the source sentence is done using the Parts Of speech tagger. In our work we use Stanford POS tagger for the tagging purpose. The English sentences are taken as an input to the parts of speech tagger. The tagger tokenizes each word in a sentence and identifies the parts of speech information such as verb, noun, adjective etc. of that word. Then the words and their tagged information are stored in a separate file which is used for reordering of sentences. Characters are arranged in document lines following some type setting conventions which we can use to locate characters and find their style. The above complex sentence can be split into simple sentences.

**Segmentation:** 1. Ravi waited for the train, 2. but the train was late

**Tagging:** Ravi // waited // for // the // train // but // the // train // was // late.

```
NNP  VBD  IN  DT  NN  CC  DT  NN  VBD  JJ
```

**Rule Based Reordering**

The tagged words are stored separately for the purpose of reordering according to the morphological structure of the Tamil language. The tagged words are arranged according to the order which is mentioned below UH/ PP/ WP/WRB/WDT/ NNP/ PRP/ RB/ DT/ CC/ JJ/ PPS/ WP/JJR/ JJS/ IN/ NN/ NNS/TO/ VB/ VBD/ VBG/ VBN/ VBP/ VBZ/ MD. The above mentioned order suits all most all the types of simple sentence when reordering it from English to Tamil language.
Handling Complex sentence:

Noun, adjective and adverb clauses are considered.

Step 1: Conversion of complex to minimal sentence by grouping the clauses
Step 2: Minimal simple sentence can be analyzed as mentioned earlier
Step 3: Integration of clauses into the minimal simple sentence

4.2. Morph Analyzer/ Morph generator:

The source text is passed to the morphological analyzer. Morphological analyzer extracts the root word and its feature equations. These feature equations will be used in the later part to generate or add proper inflections to the target language. The sole purpose of this module is to handle the morphology of the target language. Features stored in the target structure might be needed for producing the proper inflected target lexical form.

4.3. Transliteration

The transliteration is the process of labeling the text in one language with other. In English to Tamil transliteration, the English text is replaced with the Tamil text by preserving the spell. The SVM based Multilingual Amrita English- Tamil Transliteration tool is developed by Amrita – CEN and we use the same in the machine translation system. First the corpus of English words are collected and preprocessed. The preprocessing involves two level Romanization, segmentation and alignment. The English words are romanized into Tamil words, by English- Tamil mapping. The romanized Tamil words are again romanized back to English, by Tamil - English mapping.

4.4. Statistical Error Correction Method

Even though we write gender ending rules, in some cases accurate verb with proper gender ending cannot be obtained for Tamil language. Particularly when writing rules for past tense sentences many contradictions arises. In such cases there occurs an error in the target sentence. For example consider a source sentence “Ravi waited for the train but the train was late” for that we may get the target sentence .we have around 70 base verbs in Tamil language with all possible gender ending and tenses.

Wrong Sentence

Scheme 3

Correct Sentence

Scheme 3
5. APPLICATIONS

The list of some of the most commonly researched applications of machine translation. There is typically a well-defined problem setting, a standard metric for evaluating the task, standard corpora on which the task can be evaluated, and competitions devoted to the specific task. The problem of sentence understanding deals with understanding individual sentences, and determining their meaning in the context of preceding sentences. The problem is divided into three stages: semantic parsing, semantic classification, and discourse modeling. Information retrieval (IR) is the area of study concerned with searching for documents, for information within documents, and for metadata about documents, as well as that of searching relational databases and the World Wide Web. The FST based morphological analyzer and generators are widely implemented for many languages. Automatic summarization involves reducing a text document or a larger corpus of multiple documents into a short set of words or paragraph that conveys the main meaning of the text. Summarizations of multimedia documents are used in education, website and etc. Greatly speed ups syntactic analysis Tagging is local and No need to process the whole sentence to find that a certain tag is incorrect. The application of POS Tagging is Senses depend on semantic context and less structured, longer distance dependency.

6. CONCLUSIONS

The overall design, architecture, functions, and translation methodologies are presented and reviewed in details. The system applies Translation Corresponding Tree structure for annotating bilingual and Constraint Synchronous Grammar for analyzing the syntax of bilingual texts. A major drawback with the statistical model is that it presupposes the existence of an aligned parallel corpus. The work done based on limits to translation of complex sentences from English to Tamil. The sentences are sub divided into words using Word-Based Translation models and words are aligned corresponding to translation models. Tree can be constructed based on word alignment. for example, are generally rather loosely translated - one sentence in the source language is often split into multiple sentences, multiple sentences are clubbed into one, and the same idea is conveyed in words that are not really exact translations of each other. If tokenization creates a one-to-one mapping, the number of tokens in both languages should be the same by adjusting this parameter. The system with all the necessary modules are in place, scalability is a key to improve its performance. Transliteration, Morph-synthesizer and extracting features are on its own a big task and these have to be enhanced as well to improve the overall performance of the system along with the root word lexicon and the reordering rules. The bilingual dictionary lacks the word sense information, so the semantic ambiguity arises in the system for many words.

7. FUTURE ENHANCEMENTS

In future works increasing the re-ordering rules; increase the database entries, fine tuning the Morph generator, and scalability. The system can be translating complex sentences by creating new morphological reordering rules. An effective word dictionary file (4500 words from English to Tamil) is used in order to achieve better results in translation. Gender ending verbs for all possible tenses were created for the purpose of statistically correcting the errors in the output sentences. The system is implemented using java codes. Multiple parse trees are used handled by the Stanford parser and the dependency parser is also used in the translation system. To handling the verbal phrases is possible by the system. The transliterator is limited to the Indian place names so performance of transliterator is very low when it’s used for vocabulary words which are not present in the database. The morph generator is implemented for certain cases but the dependency information of many inflectional categories is given by the parser, such cases works well in morph generator and translation of sentences. The reordering rules are confined to the nodes of the branches and same rule could be handled for different cases with same syntactic structure. Question type of sentences are handled it is also one of the limitation of system.

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DOSA 2020: THE FUTURE OF CELL PHONE AND TABLET PC IN TAMIL INTERNET USING protégé

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ABSTRACT

Dosa Ontology is the very first multilingual ontology in Indian languages developed first in tamil letters using protégé. Dosa Ontology will be useful for all who are interested in developing semantic based tamil internet using protégé which was developed by Stanford Center for Biomedical Informatics Research (CBIR). This ontology was developed to demonstrate various capabilities of protégé to execute queries in the semantic web. It describes the different types of dosa and its ingredients, Nutritive values for each dosa. People can know all the details of dosa by having look at the object properties such as Ingredient (஭ஓர்மணட௑ட௕ப்டௌக்஑ள்), spiciness (஑஧ஞஜ஘நப்டௌ), dosa size (அ஡வுஅடிப்஛ம஖), etc... The user also knows all the details of Carbohydrates, Proteins, Lipids and Vitamins by having look at the data properties.

Introduction

Aadhaar's guarantee of uniqueness and centralised, online identity verification would be the basis for building these multiple services and applications, and facilitating greater connectivity to markets Aadhaar would also give any resident the ability to access these services and resources, anytime, anywhere in the country Aadhaar can for example, provide the identity infrastructure for ensuring financial inclusion across the country – banks can link the unique number to a bank account for every resident and use the online identity authentication to allow residents to access the account from anywhere in the country Aadhaar would also be a foundation for the effective enforcement of individual rights. A clear registration and recognition of the individual's identity with the state is necessary to implement their rights – to employment, education, food, etc. The number, by ensuring such registration and recognition of individuals, would help the state deliver these rights.

Let us listen to a sample imaginary dialogue that will take place in 2020 using cell phone and aadhaar.

ஆ஛஭ஞட்஖ர்: இஞ஧஝ப்஛ர் உ஗வுணநடு஘நம஝ அம஢த்஘஘ற்கு ஙன்டந. உங்஑ள் ச஘ஓந஝ அம஖஝஧஡ அட்ம஖஝நல் இட௓க்கும் ஋ண்ம஗? .....AADHAAR.....

ண஧டிக்ம஑஝஧஡ர்: அம஢த்஘஘ற்கு ச஘ஓந஝ அம஖஝஧஡ அட்ம஖஝நல் இட௓க்கும் ஋ண்ம஗.

ஆ஛஭ஞட்஖ர்: புக்குடி ச஘ஓந஝ AADHAAR ஋ன் ச஘னஈரூ, சுணர.

ண஧டிக்ம஑஝஧஡ர்: கரி AADHAAR ஋ன்... பம், அற்ற 6102049998-45-54610.

ஆ஛஭ஞட்஖ர்: கு வங்஑ள் இந்஘ ஘஑ணம஠ ப஛ட஠஧ஜ஧ எட௓

ண஧டிக்ம஑஝஧஡ர்: எட௓! ச஘ஓந஝ AADHAAR ஋ன் ச஘னஈரூ, சுணர.

ஆ஛஭ஞட்஖ர்: அட௅ ஋ன்ச?

ண஧டிக்ம஑஝஧஡ர்: உங்஑ள் ச஘ஓந஝ AADHAAR ஋ன் ச஘னஈரூ, சுணர.

ஆ஛஭ஞட்஖ர்: ஆங்஘ங்஑ள் இல்லை, ப஛ட஠஧ஜ஧ எட௓

ண஧டிக்ம஑஝஧஡ர்: (sighs) எட௓, உங்஑ள் ச஘ஓந஝ AADHAAR ஋ன் ச஘னஈரூ, சுணர.

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In this paper, different types of dosa are collected for the ontology creation. The ontology is classified into Vegetarian Dosa, non-vegetarian dosa and fruit dosa etc… The ingredients for the dosa are inserted into the individuals. These classifications is used for user can view the data in meaningful way. This ontology is developed using protégé 4.2 Alpha.

Protégé 4.2 Alpha is a free and open-source platform. It used to developed a meaningful ontology. This editor has many tools to view and search the data. The tools available are DL-Query tab, owl2Query tab, ACE view tab, onto graph, Spreadsheet importer etc.

Using query tools, the user can retrieve the information related to the types of dosa, such as Nutritive value, ingredients, etc. Using Onto graph tool, the user can view the structure of the ontology, like class structure, properties and individuals. Using ACE view tool, the user can view the many different views to the ACE text.

1.2.1 What Is The Semantic Web?

The Semantic web is introduced by Tim Berners-Lee. பொதுவான நுசாதானம் அடிப்படையில் "விருது"/CERN (Conseil European pour la Recherche Nuclaire (as it called in French), or European Council for Nuclear Research (in English) என்பதை "நுசாதானம்" என்று குறிப்பிடுவர் "ஹிப்டர்டெக்ச்" என்று சொல்லப்பட்டு வருகின்றது. This is the early concept of the Semantic Web, which aims to make the web more intelligent and usable by machines.
The Semantic Web is an extension of the current web that provides an easier way to find, share, reuse and combined information. It is based on machine readable information and builds on XML technologies and RDF flexible approach representing data. The semantic web provides common formats for the interchange of data.

Purpose of ontology

“People can’t share knowledge if they do not speak a common language” [Davenport & Prusak, 1998]. “An Ontology is an explicit specification of a conceptualization” [Gruber, 1993]. Ontology’s enable a better communication between Humans/Machines Ontology’s standardize and formalize the meaning of words through concepts.

ABOUT PROTÉGÉ

Protégé is a free, open-source ontology editor and knowledge-based framework. Protégé platform supports two modeling ontologies editor. That’s protégé-frames and protégé-owl editors. Protégé ontologies can be exported into a variety of formats including RDF (S), OWL and XML schema.

Protégé can be extended by way of a plug-in Architecture and a Java-based Application Programming Interface for building knowledge-based tools and applications.

Protégé-OWL editor enables users to:

- Load and save OWL and RDF ontologies.
- Edit and visualize classes, properties, and Rules.
- Define logical class characteristics as OWL expressions.
- Execute reasoners such as description logic classifiers.
- Edit OWL individuals for Semantic Web markup.

PROTÉGÉ 4.2 alpha

Protégé 4.2 Alpha is a free, open-source platform that provides a growing user community with a suite of tools to construct domain models and knowledge-based applications with ontologies At its core, Protégé implements a rich set of knowledge-modeling structures and actions that support the creation, visualization, and manipulation of ontologies in various representation formats. Protégé can be customized to provide domain-friendly support for creating knowledge models and entering data.

Conclusion

The semantic web is an extension of the current web in which information is given well defined meaning, so that the machines can understand the content of the web and provide the relevant information for the user’s query. The dosa ontology is created with the tool protege4.2 alpha. This helps the user to fetch the relevant information by using this in semantic web applications. We have demonstrated the usage of protégé for creating the ontology in tamil fonts. Protégé can create the java scripts which will run in selected hand held devices. This attempt is a pilot study for tamil e-commerce and e-business.

Appendix 1: A sample ontology created in Tamil-English
Appendix 2: A DL query executed in Protégé
Sense Mining for Tamil

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Abstract

Sense mining is classifying a sentence as subjective or objective and expressed it as Positive, Negative or Neutral. As the web has proliferated, opinions about various entities have also proliferated. There is a need to understand the sense of the contents expressed. The domain of sense mining focuses on this aspect. Sense mining for Tamil is a non-trivial task. The early work in the domain has focused on aspects such as bag of words, support vectors or rating systems. Natural languages like Tamil need more sophisticated approaches which focus on the granularity of the grammar and richness of the lexicon. In this work, a simple sense mining approach that takes into account the capability of the lexicon is outlined. This work will form the base for more sophisticated approaches in the future.

1. Introduction

Sense mining is an unique research in text and information retrieval in that the focus is on aggregating the contents and deriving an overall foci. This foci is finally expressed in the form of a classification of word tense. This itself is tough as there are a lot of combinations that are possible in natural languages. Double negative, positive negatives are some of the combinations which can test even experts. The work in the domain can be classified into machine learning, lexicon based and grammar based systems. The challenge in machine learning is the adaptability to new untrained text. The lexicon based statistical works focus on the advances in the clustering systems to identify the cluster in which the smoothened output resides. This cluster based approaches work with lexicons and are effective for untrained text. But, classification is difficult. Grammar based approaches rely on the codification of the text. The issue here is that lots of opinions need not follow the subject verb object structure of the grammar.

The seminal work in this domain is [1] which provides a framework and methods for identifying the sentiments and a rich set of rules for the analysis of subjectivity. This is the basis for this work. [2] provided a framework for the architecture and implementation of the system. They have given a direction for the work to be extended in the future. The approach used in [3] to classify the words into the categories (Nouns, verb, adverb) are used in this work.

2. Proposed work

The stages in Sentiment mining for Tamil are given in Figure 1. The key stages are as follows.

- Linguistic processing
- Parts of speech and semantic tagging
- Opinion identification

Linguistic preprocessing

The two steps involved are the initial splitting and form reduction. The text in the opinion is split into sentence level structures. This is done with a parser and the use of syntactical constructs like ".".

Parts of speech and semantic tagging

In this stage, the sentences are tagged with the use cases such as

- JJ: adjective
- CD: cardinal and
- NN/NNS, VB/VBD/VBN/VBG, RB/RBR/RBS represent different forms of noun, verb and adverb.
The critical aspect is that lexicons must be used for this stage.

Figure 1: Overall architecture

Opinion identification

The lexicons can give the sense of the words. But, a classification system is needed to identify the proper sense of the terms. The following rules are used as a guideline.

- Negative --> Negative
- Positive --> Positive
- Negative Negative --> Positive
- Negative Positive --> Negative
- Decreased Negative --> Positive
- Decreased Positive --> Negative

The output for various use cases are shown below. If the sentence is neither positive or negative it is classified as neutral.

4. Methodology and use cases

The following examples explain the thrust of this work.
LINGUISTIC PREPROCESSING:

SIMPLE SPLITTING

1. தூக்கி மூவை வலிப்படுத்தாது முற்பட்டிய முற்பட்டிய ஒளியும் முற்பட்டிய ஒளியும், குறியான கூற்று அறிவிக்கும் அளவையக் குறிப்பிட்டான மற்றும் சுற்று புத்தகத்துறை.
2. பாஷாங்கு குற்றிய விளக்கம் விளக்கம் விளக்கம் விளக்கம் ஆளும் அறிக்கையன திக்கு முன்னிலை

CONJUNCTION

1. தூக்கி மூவை வலிப்படுத்தாது முற்பட்டிய முற்பட்டிய ஒளியும் முற்பட்டிய ஒளியும், குறியான கூற்று அறிவிக்கும் அளவையக் குறிப்பிட்டான மற்றும் சுற்று புத்தகத்துறை.
2. பாஷாங்கு குற்றிய விளக்கம் விளக்கம் விளக்கம் விளக்கம்
3. ஆளும் அறிக்கையன திக்கு முன்னிலை

PARTS OF SPEECH

1. தூக்கி) NNS) குற்றிய (JJ) குற்றிய (NNS) குற்றிய (NNS) பாஷாங்கு (NN) பாஷாங்கு (JJ) (RB) (NN) குற்றிய (RB) குற்றிய (NN) குற்றிய (NNS) பாஷாங்கு (NNS) பாஷாங்கு (VB) (NN) (NNS) பாஷாங்கு (VB)
2. பாஷாங்கு (RB) (MR) (NNS) (NN) (RB) (NN) (NN) (RB) (RB) (NN) (NNS) (RB) (RB)
3. ஆளும்) IN) ஆளும் (JJ) (JJ) (RB) (JJ) (JJ) (NN) (NNS)

Output

1. தூக்கி, பாஷாங்கு, பாஷாங்கு are POSITIVE. முற்பட்டியம் is NEGATIVE
2. No Polarity is found. Its NEUTRAL
3. மேடைக்குறிப்பிட்டும் is negative.

So the given paragraphs polarity is NEGATIVE.

EXAMPLE 2

மேடைக்குறிப்பிட்டும் முரண்டு பற்றியும் அறிவிக்குள் தோற்றக் கூறுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள்

பூம்பியம் பூம்பியம் பூம்பியம் பூம்பியம் பூம்பியம் பூம்பியம்

பூம்பியம் பூம்பியம் பூம்பியம் பூம்பியம்

பூம்பியம் பூம்பியம்

LINGUISTIC PREPROCESSING

SIMPLE SPLITTING

1. மேடைக்குறிப்பிட்டு முரண்டு அறிவிக்குள் தோற்றக் கூறுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள்
2. ஆளும் பற்றியும் பற்றியும் பற்றியும் அறிவிக்குள் தோற்றக் கூறுகள் மற்றும் கூற்றுகள் மற்றும் கூற்றுகள்

CONJUNCTION
1. So far we have progressed in identifying the overall sense of reviews. The work has been done by hand and the algorithm and architecture are under development in the software system now. The results of the work over 18 use cases show that the results obtained in this work are consistent with the overall expert opinions. For this, the approach was applied to the select reviews. An expert well versed in movies was asked to give the tense of the work without knowing the results of the proposed approach. The results were compared.

5. Conclusion and future work

At present the algorithm is at a developmental stage, but shows a lot of promise for Tamil. The algorithm will be customized for a large set of use cases and combinations and implemented in the software in future and the results shared. The proposed approach focuses only on three sense: Positive, negative and neutral. In future this will be expanded with more sense words being used.

References

Sense Mining for Natural Language Processing using Collaborative Filtering Approach

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Abstract

Text mining refers to the process of deriving high-quality information from text. Analysis of sentiments of the content for natural languages is a non-trivial task. Existing methods consider only the keywords or ontology based 'related words'. The sentiments expressed are difficult to express and manipulate. The objective of this work is to propose a methodology for sentiment mining of natural language content (Tamil) for a specific domain. A specific domain (movie reviews) is taken and the sentiment mining system is applied for this system. The novelty of this work is in the methodology of the sentiment mining system for Tamil.

1. Introduction

Reading and understanding a sentence could be easy for humans even though there are lots of ambiguities. To overcome this problem Word Sense Disambiguation (WSD) task is to be done which assigns the appropriate sense for all the occurrences for ambiguous words. Sentimental Analysis is a complicated field which involves the process and interpretation of Natural Languages. It does not depend on specific sentence or text. The first work in sentiment mining involved the use of NLP techniques. [1] used part of speech tagging to estimate a 'semantic orientation' of meaningful phrases in Opinions reviews. The entire review was then classified as either positive or negative by averaging the semantic orientation of the phrases within. The application of a number of different machine learning techniques to sentiment classification. A Naive Bayes classifier, maximum entropy and support vector machines were used classify movie reviews as either positive or negative. Using unigrams, the support vector machine gave higher levels of accuracy, but needed trained data sets[2]. Part of speech tagging is the most commonly encountered, though there are also papers detailing classifiers using co reference resolution[3], and even the use of a full syntactic parse tree. The Stanford POS tagger uses a maximum entropy technique [4]. To avoid constantly referencing a subject by name, natural languages usually contain alternative words that can be used when referring to a previously mentioned subject.

2. Proposed System

Our proposed approach consists of the following stages: Parsing, Parts of speech tagging and Emotion classification. In our work, the crucial contribution is in the emotion classification process. The emotion classification system considers the entire document as a source and tries to make many passes over the given text to identify the proper word senses and disambiguate it. The lexicon is modified to account for

- similarity to the classifiers
- encode domain knowledge
- encode the knowledge about the structure of reviews.

In movies, the following classifiers: action, thriller, sentiment, sadness, love and comedy are used. Hence not only is each term/Part of speech parsed for its meaning, but its relevance to the classifier. In our experiments we have used the existing movie review to determine the emotion. Movie review contains positive and negative sentences of the movie. We experimented the result using Proposed approach, Statistical approach and Expert View. The statistical view comprises of counting the occurrence of terms to the classifiers and categorizing it. Experts views are taken as the final judgment. The following table (Table 1) shows evaluation of result using various methods.
Table 1: Comparison of methods

<table>
<thead>
<tr>
<th>Name of the Movie</th>
<th>Proposed Approach</th>
<th>Statistical Approach</th>
<th>Expert View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thupakki</td>
<td>Action</td>
<td>Action</td>
<td>Action</td>
</tr>
<tr>
<td>Pizza</td>
<td>Thriller</td>
<td>Action</td>
<td>Thriller</td>
</tr>
<tr>
<td>Naduvula konjam Pakktha Kanam</td>
<td>Comedy</td>
<td>Comedy</td>
<td>Comedy</td>
</tr>
<tr>
<td>Thandavam</td>
<td>Action + Love</td>
<td>Action</td>
<td>Action + Love</td>
</tr>
<tr>
<td>Poda Podi</td>
<td>Love</td>
<td>Love</td>
<td>Love</td>
</tr>
<tr>
<td>Neerparavai</td>
<td>Sadness</td>
<td>Sadness</td>
<td>Sadness</td>
</tr>
</tbody>
</table>

**Statistical Approach:** Based on statistical approach (Figure 1) thupakki movie falls under action movie.

**Proposed Approach:** By doing proposed approach we have chosen the words which describes about the movie exactly. The below mentioned are the words taken form the thupakki movie review.

![Word Count](image_url)
Based on proposed approach thupakki movie comes under action movie.

**Statistical Approach:** Based on statistical approach pizza movie falls under action movie.

**Proposed Approach:** The below mentioned are the words taken form the pizza movie review.
Based on proposed approach pizza movie comes under thriller movie. In all our use cases so far done, the proposed approach is always equal to or better than the performance of the statistical approach. This is because our approach not only counts the occurrence but defines the co-occurrence based on the lexicon as well.

3. Conclusion

The main technique used to sentiment mining was the emotion classification system. This paper gives an outline for the sentiment mining for Tamil movie reviews in Tamil. Further development of framework could be applying technique can also be implemented using the software. So far, we have implemented and tested this by hand only. In future we can explore the possibility of dynamic online based systems.

4. References

SEMANTIC ROLE LABELING OF TAMIL DOCUMENTS
AN AID FOR CONCEPT - BASED CLASSIFICATION

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ABSTRACT

The aim of this work is to design and implement a system to identify, analyze and tag the constituents in the sentence which fill a semantic role expressed by some target verbs of a sentence in Tamil. The system reads a Tamil text document and performs tagging of semantic roles associated with a given target verb within such a document. Any two terms can have the same frequency in the documents, but one term contributes more to the meaning of its sentences than the other term. Thus, the underlying model should indicate terms that capture the semantics of text. In this case, the model can capture terms that present the concepts of the sentence, which leads to discover the topic of the document.

1. INTRODUCTION

Natural Language Processing (NLP) is the computerized approach to analyzing text that is based on both a set of theories and a set of technologies. Natural Language Processing is a theoretically motivated range of computational techniques for analyzing and representing naturally occurring texts at one or more levels of linguistic analysis for the purpose of achieving human-like language processing for a range of tasks or applications.

A new concept-based mining model that relies on the analysis of both the sentence and the document is introduced. The concept-based model can effectively discriminate between non-important terms with respect to sentence semantics and terms which hold the concepts that represent the sentence meaning. It performs the mining process based on lists of words and stems. It uses a concept-based approach to add semantics into the mining process. Thus the system proposes an effective and simple approach of combining different semantic role labeling systems which significantly improves its performance.

In the few last years there has been an increasing interest in shallow semantic parsing of natural language, which is becoming an important component in all kind of NLP applications. As a particular case, Semantic Role Labeling (SRL) is currently a well defined task with a substantial body of work and comparative evaluation. Given a sentence, the task consists of analyzing the propositions expressed by some target verbs of the sentence [2]. In particular, for each target verb all the constituents in the sentence which fill a semantic role of the verb have to be recognized. Typical semantic arguments include Agent, Patient, Instrument, etc. and also adjuncts such as Locative, Temporal, Manner, Cause, etc.

2. SYSTEM FEATURES

From the set of concept terms and their semantic role, a machine learning technique is developed for a system that generates simple sentences with labels. By annotating the corpus using part of speech tagging, chunking and semantic role labeling processes, preprocessing work is done. These are capable of producing the appropriate sequence of semantic roles of the concept term for realizing sentence.

SRL (Semantic Role Labeling) is the process of detecting basic event structures such as who did what to whom, when and where. It identifies the arguments of a given verb and assigns them semantic labels describing the roles that play in the predicate i.e., identify predicate argument structures. There are many syntactic variations possible in the understanding semantics of the Tamil sentence. The structural view of mapping from input to output structures involves the input is to be text enriched with morpho-syntactic information and output is to be a sequence of labeled arguments[7]. The linguistic nature of the problem is handled by the argument identification which is strongly related to syntax.
3. CURRENT WORK

POS tagging tool for Tamil has been used for POS tagging of Tamil document corpus. The POS tagged corpus is input for the Chunk parsing. Chunking tool for Tamil has been used for Chunking of POS tagged corpus. This Phrase chunked corpus in input to the Semantic role labeling process [3]. Automatic generation of natural language text is an essential task in many language processing like summarization, automatic document generation, question answering system, translator etc. This learner is to be designed as a statistical model that is formulated from a preprocessed corpus of sentences. The semantic role labeling is also a tagging process by which the semantic roles like subject, action, agent, co agent, location, time, manner, direction, cause, extent, purpose, negation and modal of each concept in a sentence[10].

![Figure 1: Overall System Architecture](image)

4. SYSTEM METHODOLOGY

In this paper, syntactic variations are handled by mapping from input to output structures. Input is the text which is enriched with morpho - syntactic information. Output is a sequence of labeled arguments. In semantic role labeling the goal is to group sequences of words together and classify them by using semantic labels. For meaning representation the predicate-argument structure that exists in most languages is used. In this structure a word (most frequently a verb) is specified as a predicate, and a number of word groups are considered as arguments accompanying the word (or predicate).

4.1. SRL – Process

The process involves the identification the semantic relationships, or semantic roles, filled by constituents of a sentence within a semantic frame. Given an input sentence, the system labels constituents with either abstract semantic roles such as AGENT or PATIENT, or more domain-specific semantic roles such as SPEAKER, MESSAGE, and TOPIC[1]. In terms of processing a sentence to extract its meaning, it corresponds to the idea that the analysis can be decomposed into two stages. A few NLP programs perform the input translation in a single stage called as "conceptual" or "semantic parsing, but more often the task is split into two phases "Syntactic Analysis" (or "Parsing") and "Semantic Interpretation".

The first stage uses grammatical (syntactic) information to perform some structural preprocessing on the input, to simplify the task of the rules which compute a symbolic representation of the meaning. This preprocessing stage is usually known as parsing, and could be roughly defined as "grouping and labeling the parts of a sentence in a way that displays their relationships to each other in a useful way". The structure built by the parser should be a suitable input to the semantic interpretive rules which will compute the "meaning" of the sentence.

Natural Language Understanding Question Answering
In linguistics, syntax are the rules of a language that shows how the words of that language are to be arranged to make a sentence of that language. Hence it is the study of words that are combined together to form sentences. The purpose of syntactic analysis is to determine the structure of the input text. This structure consists of a hierarchy of phrases, the smallest of which are the basic symbols and the largest of which is the sentence. It can be described by a tree with one node for each phrase. Basic symbols are represented by leaf nodes and other phrases by interior nodes. The root of the tree represents the sentence. The goal of syntactic analysis is to parse the lexemes into a parse tree. According to syntax the component parts of a sentence are called constituents which are the natural groupings of a sentence. Each of them has:

- a Grammatical Category (Whether it is a noun phrase, a verb phrase, etc)
- a Grammatical Function (whether it is the subject, or object, or predicate, etc)

Semantic Analysis

This is the level at which most people think meaning is determined, however, as one can see in the above defining of the levels, it is all the levels that contribute to meaning. Semantic processing determines the possible meanings of a sentence by focusing on the interactions among word-level meanings in the sentence. This level of processing can include the semantic disambiguation of words with multiple senses; in an analogous way to how syntactic disambiguation of words that can functions as multiple parts-of-speech is accomplished at the syntactic level. Semantic disambiguation permits one and only one sense of polysemous words to be selected and included in the semantic representation of the sentence. A wide range of methods can be implemented to accomplish the disambiguation, some which require information as to the frequency with which each sense occurs in a particular corpus of interest, or in general usage, some which require consideration of the local context, and others which utilize pragmatic knowledge of the domain of the document.
4.2. Word Sense Disambiguation

The purpose is to mark each word with a syntactic tag. It involves the following methodology such as assigning each word all the possible syntactic tags and disambiguate words as much as possible using linguistic information (hand-coded rules) and risks are avoided by leaving the words ambiguous than guess wrong. Treat sense disambiguation like POS tagging, just with “semantic tags”

The problems differ as follows:

- POS tags depend on specific structural cues (mostly neighboring tags)
- Senses depend on semantic context – less structured, longer distance dependency

4.3. Handling Complex Sentences

Complex sentences with noun clause, adjective clause and adverb clause are considered. Grouping the clauses is the main process of the parser. The clauses are generally indicated by special cue suffixes / cue phrases. Grouping is done by the position of cues. These complex sentences are parsed by the following steps,

- Conversion of complex sentences into simple sentence by grouping the three clauses with their corresponding words and forming Noun Clause and Verb Clause.
- Parsing the simple sentence can be done.

5. APPLICATION OF SRL – CONCEPT BASED CLASSIFICATION

Usually the category profile preparation and test document ruling feature extraction process were done based on statistical analysis of one or more terms. i.e., literal keyword investigation is done to extract features. The profile or feature set of such systems would be a collection of keywords. The problem here is that, when more than two terms have the same frequency in a document, one may contribute more meaning than the other. The procedures of identifying such terms which capture the meaning of the sentence are known as the concept based mining approach. Here we come-up with a system that prepares profiles and feature set as a collection of concepts instead of keywords. This concept filled profile will explain the intension of the text in a much better manner. The frequency of the term of concept is known as concept factor. The concept factor is identified at different levels of the text including sentence, document and corpus.

The concept of the sentence is analysed with the aid of the Semantic Role Labeller. It is the process of labelling the sentences according to its Part-Of-Speech (POS) . In shallow semantic parsing, semantic tags are assigned to the arguments, or case roles, associated with each predicate in the sentence. Initially each labelled part of the sentence is considered as a concept. The term frequency of each concept is analysed by the labels assigned at the sentence level but not by the literal count of keyword occurrences. Then the concept investigation is extended to the document level. Document level concepts are identified by surveying the relationship between the concepts of sentences. Thus here the content of a text is described by a set of concepts. [11]

Each sentence of the document is labeled by a semantic role labeler that determines the terms which contribute to the theme of that sentence. Each term that has a semantic role in the sentence is called a concept. Shallow semantic parsing is a process to annotate naturally occurring text with semantic roles that can facilitate the discovery of patterns of information in large text collections producing such a mark-up. Who is doing What to Whom (WWW) classifies the contribution of each term in a sentence to the main topic of that sentence [12].
6. CONCLUSION

To date, SRL systems have been shown to perform reasonably well in some controlled experiments, with standard test collections for Tamil. Still, a number of important challenges exist for future research on SRL. It remains unclear what is the appropriate level of syntax needed to support robust analysis of semantic roles, and to what degree improved performance in SRL is constrained by the state-of-the-art in tagging and parsing. Beyond syntax, the relation of semantic roles to other semantic knowledge (such as WordNet, named entities, or even a catalogue of frames) has scarcely been addressed in the design of current SRL models. A deeper understanding of these questions could help in developing methods that yield improved generalization, and that are less dependent on large quantities of role-annotated training data.

7. FUTURE WORK

Indeed, the requirement of most SRL approaches for such training data, which is both difficult and highly expensive to produce, is the major obstacle to the widespread application of SRL across different genres and different languages. Given the degradation of performance when a supervised system is faced with unseen events or a testing corpus different from training, this is a major impediment to increasing the application of SRL even within Tamil, a language for which two major annotated corpora are available. It is critical for the future of SRL that research broadens to include wider investigation of unsupervised and minimally supervised learning methods. In addition to these open research problems, there are also methodological issues that need to be addressed regarding how research is conducted and evaluated. Shared task frameworks have been crucial in SRL development by supporting explicit comparisons of approaches, but such benchmark testing can also overly focus research efforts on small improvements in particular evaluation measures. Improving the entire SRL approach in a significant way may require more open-ended investigation and more qualitative analysis.

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Application of Natural Language Processing Techniques to Augmentative Communication Systems

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Natural language processing is an efficient example to denote the interaction between humans and computers. The computer fetches the input; and transforms the meaningful information into natural language; and finally, produces natural language as the output. NLP falls under the category of computational linguistics. There are several forms of techniques and applications of the natural language processing. The goal of this paper is to identify the potential applications of natural language processing techniques that can be incorporated in the augmentative communication systems. This research can extend the communication rate of the children / individuals who are with physical disabilities.

Augmentative and alternate communication (AAC) system refers to an integration of components that include symbols, strategies and aids that enhance the communication abilities. This is commonly used to semantically process the contents and communicate in an effective manner with the recipients. In an AAC system, the main purpose of communication is to convey information, monitor and control the social interactions or control the environment. In the process of employing the natural language processing techniques in the AAC system, the semantic interpretations tend to conflict. The input to the system is a set of content words – “Car See Pinky Now”. The regular system implementation does parse the content semantically to classify the grammar of the words and relate the term with language specific instantiations.

The final sentence processing yields the meaningful content as “The Car Is Seen By Pinky Now”. The paper here presents the general processing phases that take place within an AAC system and the various techniques that could be employed for better communication and understanding of the contents of the sources. These techniques might help in attaining the granularity of the representation of the knowledge and delivering the right content as a result of the language processing within the system.

Natural Language Processing

Natural language processing has evolved with multiple techniques that would simplify the source text and present the right components as the result. The techniques of NLP enable the users to accomplish the purpose of the language analysis. Naturally occurring texts might refer to any form of language, genre and mode; and these might be in oral or written forms. The texts generally evolve with no intended purpose (Liddy, 2003). According to the human-like language processing, NLP might even be regarded as a category of artificial intelligence.

The model of NLP involves the seven major components namely phonology, morphology, lexical, syntactic, semantic, discourse and pragmatic. These components have modified the basic approaches that were followed to implement natural language processing in the experiments and real life scenarios. The approaches are classified into four broad categories namely connectionist, symbolic, statistical and hybrid. Each of these approaches follows similar processes. However, the purpose and activities involved in every process differed to a greater extent (See Figure 1).

Having known the richness of natural language processing in transforming the undefined and meaningless information to clear and meaningful information, the applications have grown enormous. The commonly used applications where the NLP is significantly used include information retrieval, information extraction, dialogue systems, summarization, question-answering and machine translation. The machine translation application is a conventional one and it simplifies even higher levels of analysis. However, the other applications are embedded in the commonly used systems for various lexical analyses and uses under different environments.
Stages of NLP

NLP is basically a three stage process that involves parsing, translating and generating the input contents. The output of every stage is fed as the input to the next stage of the system. The natural language processing works based on semantic structures and generations. Hence, the first step is to find out the possible interpretations for the input through the semantic parser (Liddy, 2003). The problem here is that a word can fall under several semantic classifications. With a sub frame designed for every word as in input, the semantic type is designed and is substituted to the word to develop the interpretations. For instance, ‘take’ can be replaced by ‘get’ and ‘from’.

The translator serves as the middleware to the system. The main use of this stage is to create placeholders for the words in the translator’s dictionary and covert the words with probable structural translations. Syntactic realization takes place at the second stage of the natural language processing. The generator phase is primarily responsible for the sentence generation based on the knowledge of specific language. The result becomes the final component of the entire system. Lexical classification and generation take place at this final stage. The output of the NLP system directs the patient with the right options and translations for their doubts (Liddy, 2003).

Augmentative and Alternate Communication

Communication generally requires a mutual understanding between the speaker(s) and receiver(s). The dynamic process becomes complex when the communication disorders arise. For instance, in autism which is a cognitive language disorder has presented numerous hindrances to the type of communication being held between people. The augmentative and alternative communication systems (AACs) mainly aim at eliminating the communication disorders of people by introducing new substitutes for communication (Figure 2). Some of the speech pathologists make use of paper based PECS to effectively improve communication with people having disorders. On the other hand, technical solution like plasma picture communication table is also used to interact in a creative and fun-filled method (Vanderheiden, 2002).

The paper based communication system is effective even when it is embedded in the mobile devices so that children who are experiencing severe autism might use it as a tool to convey information. There are also AAC systems to address complex communication needs. Some people might experience physical and sensory issues that might restrict them from communicating with people. For these groups of people, communication is facilitated with advanced techniques along with training to explain the movement patterns and enhance the participation of the patient in the society.

In today’s trend, speech pathologists and linguistic systems support AAC technologies and concepts mainly because the service delivery is effective and the regular human interventions are overcome in that case (Leroy & De, 2010). The application of AAC systems is widened to people of any sort of communication needs and to those who are in need of additional aids. Knowledge transmission and reception processes become easier and are carried with relevant evidences in case of AAC systems.

NLP in AAC

The individual benefits of NLP and AAC systems are enormous. When these concepts are grouped together, it delivers a better space for communication with no evidence of disorders. For people suffering from autism, the concept of NLP in AAC would be fruitful. NLP helps in the development and delivery of semantic structure whereas AAC helps in presenting new substitutes to the ease communication. In this scenario, it shows that when NLP is used in AAC, it is feasible to ease communication by clearing the semantic ambiguities and similarities; and providing a clear text as a result to the recipient (McCoy et al, 1990).

Language disorders might be experienced either in the reception type or expression methods. As mentioned earlier, a NLP in AAC system might simplify the communication by breaking the words, matching the words with its context and grammar and reframing the sentence in a meaningful manner. For instance, the sentence “Work I Done” is presented as follows:

Step 1: The words in the sentence are broken separately. The result is: “Work, I, Done”.
Step 2: The semantic parser parses the words and matches the words with the appropriate grammar. Subsequently, the context is also analyzed.

Step 3: The words are also compared with relevant aids such as pictures to identify the relations and patterns of them.

Step 4: The semantic strategy gives the result as “Work Is Done by Me”.

Step 5: The results of the strategy are considered and the individual’s cognitive level is evaluated.

Step 6: If the cognitive level is very low, the picture-based communication is made. If it is medium, then paper based or even speech-based communication can be made to convey the end result.

In this process, the steps 1, 2 and 4 are carried out by NLP and the purpose of the process is accomplished when NLP is involved in AAC to deliver the result based on the intended recipient’s cognitive level.

NLP in AAC is often considered as the best interface to communicate with the patients (McCoy et al, 1990). As the mere aim of the system is to relieve the person with disorders and enhance the efficiency, the machine translation is used in case of NLP; and the AAC system covers the phonetic and lexical ambiguities faced by the patient. In most of the cases, the patients feel the linguistic ambiguity either due to the context or phonetics used by the speaker in the oral communication. When written communication is taken into consideration, grammar, lexical levels and type of narration might confuse the readers.

People with speech and language disorders expect a high level of clarity in the information presented and the AAC system does assure clarity through different means. When the patient accesses the AAC system, he / she tends to receive multiple formats of a sentence so that there is a consistency in the information delivered and relevance of the words used. The communication aids are generally chosen depending on the patient’s abilities. The application of NLP in AAC is expected to develop a new world of communication in terms of clarity and ease in understanding and capabilities.

APPLICATIONS OF TECHNIQUES OF NLP

NLP in Just-In-Time Vocabulary Support

Lack of knowledge of Vocabulary is a serious problem for most of the patients. The problem with the interpretation is that a sentence might, at times, match with multiple meanings and there develops a serious issue in choosing the right one among them. Just-in-time vocabulary support is primarily designed with an aim of assisting the patients with context-based vocabulary support so that the complexity in understanding the language is minimized. The vocabulary coverage is vast as it identifies and presents all possible meanings for a particular word. When a sentence is analyzed with the help of this vocabulary support, it adds clarity to the resultant meaning (Epp et al, 2012).

When NLP is employed in AAC system, it breaks the sentence into its set of words and compares each one of them with the vocabulary support system. The result that indicates the highest match is thus presented to the patient. When the patient enters three different keywords namely ‘paper’, ‘paper please’ or ‘just one paper’, they all denote the same context that the person needs paper. So, as a result the device gives the output to the patient. This is certainly a new experience and an advantageous one to the patients who are experiencing problems with vocabulary.

NLP in Language Tasks

The commonly performed language tasks are vocabulary development, daily activity on studying word lists and regular activities on acquisition of knowledge with the help of tools. These seem to take place in classrooms as well as at home. The connectionist approach of NLP is used here to monitor and sequence the language tasks (Conover et al, 2012).

Generalized models of the words are developed and connectionist representations are employed. These would eliminate the constraints in the manipulation of sentences. Moreover, when this approach is used in an AAC system, it certainly improves the connectedness of the children with the society and the local interacts are greatly enhanced. These language tasks might develop ambiguities or issues related to inference. However, these are easily resolved with the connectionist approach of NLP as it employs advanced mechanisms to eliminate word – context ambiguities, inference issues and language generation issues (Conover et al, 2012).
Whenever there is a query raised by the student / patient, the AAC system delivers the task result with relevant vocabulary terms as well as the semantic representations. These representations could be in the form of images that indicate the connectivity between the terms. By this deployment, the understanding skill is improved and the students tend to learn new terms at a rapid pace more than as expected. The speech language pathologist might witness the progress of the patient in terms of communication and minimization of the language disorders.

**NLP Translator for Speech Generating Device**

Speech generating devices (SGD) are the commonly known voice output communication aids that were particularly used for people with linguistic or phonetic disorders. These devices contain the contents and vocabulary that are varied depending on the user’s requirements and the contexts. The patient operated selector mechanism works on the symbols that are equipped with photoelectric cell to enable the patients to read the characters at an ease. The system is connected with a typewriter so that the patients can type the contents with proper aid available to recognize and distinguish the letters (Vanderheiden, 2002).

The speech generating devices are said to be easier modes to imbibe knowledge on the language. NLP has a potential application in these speech generating devices. As already mentioned, the context of the input might influence the output obtained from the device. In case of fixed display speech generating device, the symbols and items are stationary whereas dynamic display device tends to generate visual symbols in a dynamic way where the symbols can even be changed by the user. In such a situation, the NLP is to be employed in the selection set and vocabulary of the speech generating device. The selection set is actually a collection of messages and codes that a person can use.

When the content is chosen, NLP’s translator would produce a better result. It can automatically translate the inputs as per the language definition and produce the right language outputs to the user. The automatic maintenance is only an advantage to the user as the contents are translated and stored in an up-to-date manner. Whenever the user accesses the system to learn the language, the translated outputs are also displayed as options. This process is certainly expected to improve the vocabulary of the patient. The introduction of NLP to this particular type of AAC can increase the rate of action and performance.

**Symbolic Approach for User-Centered Design System**

The main purpose of the user-centered design system is to ensure universal usability for the people with disabilities in accessing the system. The system is developed with the notion of “design for all”. This augmentative and alternate communication system involves flexible interfaces, common dimensions appropriate for educational purposes, good presentations and high dynamism (Newell & Gregor, 2000). The presentation of information is the most important of all. People with disabilities switch to these types of systems as aids and so, there is a need for better functionality. The user-centered design system involves both mainstream as well as supportive systems that covered the entire aspects of the learning process.

The natural language processing to this particular type of augmentative and alternate communication is certainly supposed to increase the overall efficiency. In the interface and user-centered designs, there are even options for the patients to enter the inputs as it is basically a dynamic system. In such a case, the introduction of natural language processing can eliminate the difficulty of the users in finding the right choice (Newell & Gregor, 2000).

Firstly, the semantic parser can be used to process the input from the user panel. As the sensitivity is generally high in these systems, the sensitivity can be controlled with the semantic parser operation. Subsequently, the results of the middleware (translator) can be useful for the patients as they tend to get several choices. The final step of generation will produce the exact result that is highly suitable for the system. In these phases, the symbolic approach of NLP is being used as the user-centered system involves several symbols and dialects to improve the overall interactivity.

The symbolic approach for this system will benefit in a better way as the rules are human developed. The representation schemes are primarily set with the motive of applying in user-centric system. The implementation of this NLP approach to AAC system will work based on the semantic networks. It works as follows. Whenever the user raises a query, the decision trees and explanation-based learning are invoked. So, the query undergoes the three phases of NLP and the
output will be the result of explanation-based learning or decision tree. This might improve the reasoning skill as well as the learning process is incorporated with efficient strategies that can assure fruitful results.

A general AAC system for user-centered requirement is not as efficient mainly because the language learning process does not include all the essential strategies (phonetic, lexical and linguistic). When NLP is included to this system, then the information extraction application ensures greater efficiency. Most of the speech pathologists prefer NLP to this system due to the quality outputs.

**Parser for Emotion Detection System**

There are several systems meant to detect the emotions based on the linguistic content present. The emotions are regarded as compound and they were analyzed further. The emotional language understanding is targeted towards the language learners who are more dependent on the expression through emotions. The emologus system works by fixing a specific emotion measure to every word in a sentence (Tallec et al, 2011). This system presents the overall architecture of this system. Depending on the total value, the patient’s emotion is measured. This process of sentiment analysis is functional in the augmentative and alternate communication methodology.

The parser of NLP system is going to even more benefit the entire emotional analysis process. The application of NLP to this system is basically to control and enhance the evaluation of semantic dependencies between the inputs. The application actually works as follows. The patient gives the input to the system. The words are individually broken and the emotion content percentage is applied to every word. Subsequently, the semantic linkages and dependencies between the words are evaluated through the parser of NLP (Tallec et al, 2011). The parser would classify the semantic functions of the words and then, the frames help in a better and accurate evaluation of the emotions. The emotions are evaluated with respect to the semantic structure they belong to.

This NLP concept is going to better the predictions of the emotions. Semantic parser of NLP helps the patients to see the preferences and the right structures that the sentences belong to. This is a way to improve the linguistic knowledge and an easier way to determine the emotion with just parsing of the individual words.

**Pictographic System**

Pictographic writing is said to be a new and potential application of natural language processing. The cognitive design that the pictograms support is highly interactive and might quickly let the people to write the text. However, the writing process becomes slow when patients are not given assistance. Therefore, the NLP would suggest sentence fragments. There are basically two major applications of NLP in this domain and these are based on the morpho-syntactic structures. The advantage of introducing this application of NLP to AAC system is that the disabled persons can enhance their domain knowledge in addition to alphabetic writing (Abraham, 2011).

For a handicapped person who wishes to write but fails to use alphabetic writing, NLP presents the pictograms where the person can simply choose and form the word. This is rather interesting; and the disabled person can understand the concept. These would improve the overall interactivity; and the linguistic and cognitive level of the person gets improved. This application is not only proposed for the people with disabilities but also to the people who are on the initial stages of learning and are finding difficulties in following it. The application area is definitely broad although disabled persons are to be benefited at the maximum. When pictograms are already built in AAC, the NLP system can associate the pictograms to relevant semantic structures.

**Assessment of NLP to AAC from Success Perspective**

AAC is a widespread system that is commonly used among the patients with autism, language understanding issues and apraxia (Cumley, 2005). Children with serious disorders associated with phonology fail to have proper communication interaction. So, the AAC system tends not only to serve as an aid for communication but also to improve the language intelligibility. As language influences the overall development and cognitive understanding of a child, the AAC systems are developed with this perspective.
There are certain issues faced by the people in the case of AAC. There are no pre-stored samples to the patients in the AAC systems whereas the application of NLP to AAC can enable better interpretation and automatic content maintenance, which resolves the above problem. The other point is that there is no option for dynamic choice of the vocabulary in an AAC system. The language representation of NLP appears to be easier, no matter whether it is a picture-based system or alphabet-based system or voice based system (Hill, 2011).

There are two major fields where NLP to AAC system can prove to be high; and they include interface design and the word prediction. The future applications are more relied on NLP due to the main reason that the word prediction adds better sense to the outputs of the AAC system. This implies that the success rate is high and there is a huge potential for these applications in the near future. The evaluations that have been conducted so far on these applications have clearly denoted that the next generation of technology is to rely on these applications and there are greater chances for the affected people / patients to overcome the disorders at a rapid pace (Hill, 2011). So, it is highly recommended to utilize these applications and also spread the idea to those patients with language / communication disorders. The authors of this paper are positive that the speech language pathologist can obtain a better result.

CONCLUSION

NLP and AAC are two different techniques and both of them go together on the semantic and language terms. AAC system serves as an aid to the patients with autism and any other form of speech and language disorders whereas NLP techniques when applied in AAC serves as an information retriever, dialogue systems that primarily ease the communication and provide instant solutions to the communication disabled. The step by step process of NLP ensures accurate outputs at the end and the output of every process is individually used for several applications. For instance, the parser might be highly appropriate for the emotion detection system. The picture-based system might involve a translator or so. However, the whole process of AAC is to support and clear the doubts of patients with relevant interface support. Some of the aspects, where AAC fails, are all overcome by the introduction of NLP to AAC. The individual applications that were stated above indicate the effectiveness of NLP techniques and the appropriate influence on the outcomes of AAC systems. As most of the patients prefer highly interactive systems to develop their language-based knowledge, NLP fills them with the maximum features. NLP provides explanations, options and trees that can enable the persons with communication disorder to improve their vocabulary and obtain a clear knowledge on the output for their respective inputs. So, the applications of NLP to AAC systems are highly efficient and mandatory for the elimination of communication disorders among people.
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Topic F
Education
தெளி
Kalvi: An Adaptive Tamil mLearning System

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Abstract

Learning Management Systems (LMS) in Tamil are at an early stage today. They typically model users as a homogenous group with content representing a static structural organization of the course material determined by the educator. In most cases, LMS users who are the primary consumers, represent heterogeneous groups with diverse learning characteristics, needs and goals. This lack of sophistication in LMS is particularly noticeable when they are used to deliver course content that are typically taught in languages other than Tamil. The adaptation of e/m-education systems to an individual or to a group based on their characteristics, expectations, knowledge, background and preferences of the students is understood as critical but is under served today. Emphasis is moving slowly towards learner-oriented platforms and putting the learner’s expectations, motivations, habits, learning styles, needs, etc. as the focus of interest. This paper delves into an LMS for Tamil language education. It also explores the mobility aspect of the LMS systems, which makes the e-learning systems available via mobile devices like iPad, iPhone, Android based devices, etc., thus making the LMS much more accessible and in line with current computing trends.

Introduction

This paper proposes Kalvi, an adaptive Tamil mLearning System, which is based on the Sakai project. Sakai is a community of academic institutions, commercial organizations and individuals who work together to develop a common Collaboration and Learning Environment (CLE). The Sakai CLE is used for teaching, research and collaboration. It is a free, community source, educational software platform distributed under the Educational Community License. Sakai is a Java-based, service-oriented application suite that is designed to be scalable, reliable, interoperable and extensible.

Anatomy of an academic course

Before we begin, let’s first take a closer look at the structure of a typical educational course. A course typically consists of an ordered sequence of learning modules. Each of these learning modules consists of a sequence of topics/lessons that introduce and illustrate concepts. The lessons could include quizzes at various points that test the learner’s grasp of concepts and reinforces previously learned concepts. Such a course can be viewed as a directed, typically acyclic graph where modules and concepts (and potentially quizzes) form the nodes. These nodes are connected by links that represent the learner’s transitions from topic to topic. Educators and students progress via links across the vertices (modules and concepts) from start to end during the life cycle of a course.

Non-adaptive and adaptive courses

In a non-adaptive course, the connecting links/arcs are static, pre-determined globally and follow a pre-determined path. In an adaptive course, firstly, the links are initially configured based on the information (descriptive attributes) available about the learner. Additionally, there are many possible link flow paths. These paths are conditional i.e. based on an ongoing evaluation/scoring of the learner’s progress through the topics over a given period. Additional nodes/topics may be brought in dynamically based on a dynamic evaluation of the learner’s level of knowledge as she/he progresses through the course. The topics introduced are driven by analytical insight gained from community use.

Existing problems

To summarize, existing problems in Tamil LMSs are as follows:

1. There are very few modern Learning Management Systems for education via Tamil language especially ones that deliver content typically taught in other languages (like English)
2. Even if they do exist, these LMS systems deliver content in a static fashion; they do not take into account the user’s preferences, level of skill, learning goals and other factors explicitly into account and use this as the basis for learning content delivery and learn from user activity

**Data mining, Machine learning and Analytics in LMS**

Data mining, Machine learning and Analytics forms the core of LMS systems.

- **Data mining and Machine learning:** Learning management systems and Learning Content management systems deal with volumes of data. Users consuming the course material leave a trail of data while performing their activities. These data can and needs to be mined to extract insight into learning patterns, learner groupings, Topic classifications (eg: easy, difficult, etc.) . Machine learning techniques like Dynamic Regression, Support Vector Machines (SVM), Neural Net engines, etc. can be employed to mine the data to extract insight

- **Analytics:** Analytics plays a big role in LMSs. The broad promise of analytics is that new insights can be gained from in-depth analysis of the data trails left by individuals in their interactions with others, with information, with technology, and with organizations. At a high level, the following are the types of analytics of interest here:
  - **Learning Analytics:** Wikipedia defines Learning Analytics as the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs. Learning analytics are largely concerned with improving learner success.
  - **Academic Analytics:** Wikipedia describes Academic analytics as the term for Business Intelligence used in an academic setting. Academic analytics is the improvement of organizational processes, workflows, resource allocation, and institutional measurement through the use of learner, academic, and institutional data. Academic analytics, akin to business analytics, are concerned with improving organizational effectiveness.

**Adaptive e-learning systems**

Now let’s take a look at adaptive e-learning systems. An e-learning system should be designed to match students’ needs and desires as closely as possible, and adapt during course progression. It is considered to be adaptive if it is capable of:

1. Modeling users, monitoring the activities of its users;
2. Interpreting these on the basis of domain-specific models;
3. Inferring user requirements and preferences out of the interpreted activities, appropriately representing these in associated models; and
4. Acting upon the available knowledge on its users and the subject matter at hand, to dynamically facilitate the learning process.

Thus, adaptive e-learning system can be described as a personalized system, which is able to:

1. Perform content discovery and assembly,
2. Provide an adaptive course delivery, an adaptive interaction, and adaptive collaboration support

**Architecture of KALVI system**

The Kalvi system proposed in the paper is built on Sakai LMS platform. At a high level, the Kalvi system has two parts to it:

1. Kalvi server
2. Kalvi client

**Kalvi server**

The Kalvi server is the backend module. It supports all the full-fledged features of a typical LMS. There is a central repository of the offered Course list. Educators can build and publish new courses via the publishing site. The students
can search the course list and select their courses of interest and take them via the community site. The server has the Adaptive Learning system as well, which is responsible for making the LMS adaptive. All data is persisted in a central backend database.

Here is the architecture diagram of Kalvi:

Kalvi client

Kalvi supports both web based and mobile clients. Students can take a course via mobile devices like iPad, iPhone, Android based devices, etc. The mobile client downloads the course from the server and saves it locally. Along with the course, the client piece of the Adaptive learning system pertinent to the course is also downloaded to the mobile device. The student then takes the course in the mobile device. While taking a course from the mobile device, it is not required to stay connected to the server. That is, courses can be taken from the mobile devices both in online and offline modes. All the data obtained by monitoring and recording student activities during the course life cycle are persisted in a local database in the mobile device. When they are connected, the Kalvi server and client can sync up periodically.

Here is proposed sample screen shot of a typical Tamil course taken from iPad:
Here is proposed sample screen shot of a typical Tamil course taken from iPhone:

Concluding thoughts and future work

The key barrier here is not the veracity of the concept or the implementation of the LMS but it is their incorporation into the current educational processes and culture which is a rather static. This is more so in Tamil LMSs and Tamil educational systems today. This requires evangelization as well as a high level of engagement from all participants in the education process to effect a change. But this is the clear trend forward. Irrespective of the subjects and courses offered, the demography served, and the medium of languages delivered to, the learning methodologies and techniques are the same as they broadly rely on data mining, machine learning and analytics to deliver adaptive learner-centric content in mobile form factors for the current and next generation of learners. The promising aspect of this paper is that the proposed adaptive LMS system could be applied ubiquitously.

Acknowledgement

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- www.apple.com/iphone
Scientific Tamil is the need of the hour. It is an essential requirement, not an option. The fortification of the scientific armamentarium of Tamil will gift self-sustenance to the language in the future. Any misleads and self-centered approaches will only pull back the wagon – a move which should not be allowed by the intellectuals of the present day population gifted with Tamil as their mother tongue. Waiting for governments and well-established organizations to do the good job is a nicer option, but not the only one. Most of the bodies do develop a slog and working difficulties as they grow, for the very rules and guidelines laid by them will slow down the progress of their work at the ground level. Individuals can make the difference; they have made it and will make it in the future as well.

Medical Education is a rapidly evolving specialty in Science. It has been duly increasingly appreciated that the concept of Medical Education is not just teaching information to the medical students but to shape them as more responsible and more intellectual professionals best suited to pursue the profession as a medical person amidst an ever increasing population of mankind in which knowledge base is maximally open even to the common man.

Medical Education units have evolved in various educational institutions across the globe and the trend has successfully spilled over into the Indian Subcontinent. The view shared by the opponents of changes in Medical Education originates from the fear that the radical changes may alienate the students from the traditional roots unique to the Indian culture, because many still believe that preparing students with global outlook can actually make them belittle their local and traditional roots. a comprehensive method of teaching is seriously required incorporating the modern and the traditional inputs cloned in elegance. The greatest advantage unique to the Indian students is their access to the classical pieces of literature left for them by the greatest Indian civilizations of the ancient World.

The Manavai Mustafa Scientific Tamil Foundation (MMSTF), a non profit, non government organization devoted to promote scientific Tamil development has crafted an unique formula that blends Modern Medical and Health Education concepts with the Classical Indian Literature - the Philocine module of Education, a process by which the students can be educated about the modern Neurophysiological concepts based on literary lines crafted some 2000 years before. The Philocine approach will be a unique venture in Tamil literature for it focuses on the concept of dissemination of knowledge more than the usual formula of praising and endowing exaggerated acknowledgements for the literary works and their authors.

The MMSTF has been successful in making many publications in National and International journals as well as in making oral presentations in the World Classical Tamil Conference, Alagappa University International Conference, and Sekkizhlar International Conference. All the presentations were done using the Philocine formula for deciphering the ancient Indian literature. The 21st century approach to ancient Tamil literature using the Philocine formula will have its ramifications well beyond the preview of Tamil Literature itself for it will enhance the human understanding of the fields of Neurophysiology and Neurobiology. In actuality the reach and importance that ancient Tamil literature would gain due to the Philocine formula will be unprecedented in the history of Tamil Literature.

After proper initial planning and groundwork the revolutionary concept of Philocine, an innovative technique that conglomerates the thought process of ancient Tamils and that of the great thinkers of the western world like Charles Darwin and Sigmund Freud was unveiled by Dr.M.Semmal on the eve of the World Classical Tamil Conference during 2010.
Enumerating the Psychophysiological Insights in the ancient Indian literature is a highly potential area for research, as a sample when considering Sangam Tamil alone - a long list of classical literatures extending up to 2800 separate works by more than 470 separate authors are present, all of them are cherished for their literary excellence for more than 2000 years were actually carrying varying grades of Scientific information’s hidden and embedded.

Able to fully appreciate the importance of E-learning for the Tamils, MMSTF has designed various innovative E – Learning modules for the development of scientific Tamil, on 15th June 2010 the “Ariviyal Tamil Mandram You Tube channel” was launched by MMSTF. This digital wing of the MMSTF is designed to impart Medical and Health Education using classical Indian Literature which would enhance the Self esteem levels of the students, it is needles to explain how greater it will enhance the process of learning among the students in the coming decades. This channel is the worlds first you tube channel exclusive for scientific Tamil. Till date 128 students have been processed by the MMSTF to present papers in various National and International conferences.

MMSTF has also introduced the concept of Medical Journal Club in Tamil and has released multiple videos in the concept of Integrating Medical, Engineering and Higher secondary school students with Physical Education students. Dissemination of recent advances in medical sciences to the common man directly from open access journals was
launched on experimental basis on the Ariviyal Tamil Mandram You Tube channel; it is designed to impart the latest of the information in simple language to the school children and the common man.

There is a strong ideology amongst many that Tamil development can be accomplished only by using the medium of Tamil, to deviate from the mainstream becomes a necessity as many second generation of Tamils have already deviated well away from Tamil, to tune them back into Tamil requires to reach them via the language well known to them and this is yet another innovative E – learning exercise by the MMSTF, all the contents in this section will be 100 percent in English, still this also means Tamil development, this is not a compromise but an innovation and an outreach, a necessity at least until the end of the next decade – purely to bring back the population from distant nations, an eventuality possible due to their extreme proximity to languages other than Tamil.

As of date the Ariviyal Tamil Mandram has processed 126 Tamil students to present papers at various National and International conferences using the E – Learning module specially designed by MMSTF, the process by which students from a rural background will be trained and processed via the internet and will be primed for the events.

The first virtual paper presentation by a team of students integrating Medical, Engineering and Sports fields were performed in the premises of the prestigious Alagappa University in 2012, It was made possible due to the E – learning strategy developed by MMSTF.
Learner Support Services and Online Distance Education: A Case Study on Bachelor of Business Management (Online) Degree Programme

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Abstract

Distance education has evolved from a teacher centered model to a learner centered model, the roles and responsibilities of instructors and other learner support providers have changed to being more practical than imprudent. In 1990’s a new generation of distance learning emerged in the form of a computer based instruction delivered over networks. The internet would begin to serve as the main medium of delivery. This type of Distance Learning course is often referred to as online learning. Bachelor of Business Management (BBM) Online Degree Programme is the first online Tamil Degree Programme in Jaffna University and which had been introduced in 2009. Due to the conflict situation in Jaffna it was commenced on 2009 however the fund was granted by the Asian Development Bank (ADB) through the Distance Education Modernization Project (DEMP) in Sri Lanka in 2006. When the programme was initiated, it faced challenges and difficulties without awareness regarding the online mode of education among the staff of the Jaffna University. Most of the students who work in the private and the public organizations follow the degree and they depend on learner support services to enhance their knowledge and skill and qualify their examination. A critical element of an effective succession program for online students is Learner Support Services (LSS). Learner support comprises all the assistance provided by a distance education or an online mode system which matches the facilities which a face to face system provides for the success of its students. LSS include tutoring mentoring, content development, Technical support services, interaction with students and administrative activities. This study examines the first time online learners’ perceptions of the learner support services provided by the faculty of Management Studies & Commerce, University of Jaffna, Sri Lanka. The study suitably used both primary and secondary data. In this case, the researcher selected 96 students from BBM online degree programme conveniently. Qualitative and quantitative techniques have been used to survey the study. The data was gathered from the forums, discussions and interview with the students with the help of structured questions. Descriptive analysis and frequency table have been used to find out the results. While many factors contribute to the learner support, the level of interaction and support are at the top of the list. It is concluded that sixty percentage (60%) of the students in Online learning program report feelings of isolation, lack of self-direction and management, and finally decrease in motivation levels. This study identifies the types of LSS strategies that can effectively address the challenges. Suggestions from the study by getting feedback from the students that the facilities such as usage of modern technology, ie using video conferencing, uploading PowerPoint presentation with sound recording and the advance instructions regarding examination and other face to face activities and the effective administrative procedures should be enhanced regarding the LSS. In order to provide LSS that help students successfully participate in online degree programme at University of Jaffna interactive strategies are needed to enhance students’ self directed learning skills and reduce their feelings of isolation. Outcomes of the study would benefit the academicians, researchers, policy makers, and practitioners of Sri Lanka and other similar countries.

1. Background of the study

In recent times the distance education mode has been developed in the developed and developing countries as one of the mode of education model which helps to all students to study without physical appearance. More universities and organizations are starting online programs. Much of this increase is due to the demands of the students who are conspired by distance education, mostly because they face a number of obstacles that make conventional method of teaching.

In Sri Lanka the Open University is an important institution providing the distance education mode system and the online learning system has been introduced by some of the Sri Lankan Universities and other institutions. Online learning system uses the web based education system and the study guidance is provided by Learning Management System (LMS). The Jaffna University provides Bachelor of Business Management (BBM) Degree programme in Tamil medium as an external degree under the faculty of Management Studies which was the first degree programme in Jaffna University.
Learner support activities include tutoring and teaching; counselling and advising including such services as orientation, learning and study skills assistance, academic advising, and career and personal counselling; and administrative activities such as admission and registration, library and information systems, and infrastructure support for activities such as peer tutoring and alumni organization. In other words, learner support activities are all those interactive processes that are intended to support and facilitate the learning process. This research explores the Students’ perception on learner support services for the BBM Online students in Jaffna University.

Traditionally learner support in distance education has been identified as being a completely different set of activities. However, with the implementation of online learning, this distinction does not always hold and the line between the two sets of activities has become much more distorted (cf. Thorpe, 2003). The BBM Online Degree programme provides the variety of LSS to the students and who are facilitated to interact with other students and teachers. No opportunities to find out the feelings of the students whether they are satisfied or not with the services. This study tries to answer the following question: “Does the first time online students perceive the learner support services of BBM Online Degree is remarkable?

The main objective of this study is to identify the online students’ perception regarding the learner support services provided by the faculty of Management Studies and Commerce. In addition to this the following objectives also are incorporated in this study.

- To find out the obstacles when the LSS are provided
- To suggest the possible solutions to overcome the obstacles and
- To recommend the strategies for learner support services to be satisfied the students.

2. Theory and Hypothesis

Learner support services play a key role (Ludwig-Hardman & Dunlap, 2003) since they serve as a vitally important and effective mechanism to counter challenges of attrition related to online learners’ sense of isolation and inability to function as self-directed learners (Keegan, 2003). In addition, knowing who the learners are and using this knowledge to inform the design and provision of learner support services increases the likelihood that they meet learner needs as well as inform best practices in this area (Hughes, 2004; Moisey & Hughes, 2008).

According to Abrami and Bures (1996) some students in distance learning programs and courses report feelings of isolation, lack of self-direction and management, and eventual decreases in motivation levels. These factors are supported by Tinto’s (1997) model of institutional departure with its central notion that student persistence is strongly predicted by their degree of academic integration (e.g., performance, academic self esteem, identity as a student, etc.) and social integration (e.g., personal interaction, connection to academic community, etc.). One of the most reliable problems associated with distance learning environments is logic of isolation due to lack of interaction (Bennett, Priest and Macpherson, 1999; Harasim, Hiltz, Teles and Turoff, 1995). This logic of isolation is linked with attrition, instructional ineffectiveness, failing academic achievement (Booher and Seiler, 1982), and negative attitudes and overall dissatisfaction with the learning experience (Thompson, 1990). In this case the following assumptions have been established as hypothesis:

\[ H_1: \text{Learner support services provided is remarkable in the BBM Online Programme.} \]
\[ H_2: \text{Students’ perception on learner support services avoids the feelings of isolation.} \]

3. Methods

The study suitably used both primary and secondary data. There are two batches are going on smoothly. This is a three year degree programme and two semesters per year. Altogether 6 semesters with 96 credits must be completed by the students. First batch is in the fifth semester and the second batch is in the 2nd semester. In this case, the researchers selected ninety six (96) students from BBM online degree programme conveniently. The data was gathered from the forums, discussions and interview with the respondents. The Learner support services have been categorized as tutoring – mentoring, content development, Technical support services, interaction with students and administrative activities. Feeling of isolation and lack of self direction and management are included under the Students’ perception which have
been measured by three point likert scale from strongly agree to strongly disagree that is related to learner support services and revealed by the percentage of respondents. In this case above the percentage of 50 has been accepted as a remarkable learner support services have been provided in this programme. The linkage between students’ perception and learner support services have been illustrated by using correlation analysis.

4. Results

Students’ perception on learner support services has been illustrated by using percentage of the respondents’ responses as follows:

Table 1: Percentage of Students’ perception on Learner Support Services:

<table>
<thead>
<tr>
<th>Learner Support Services</th>
<th>Strongly Agree or Agree %</th>
<th>Neutral or No Opinion %</th>
<th>Strongly Disagree or Disagree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutoring – Mentoring</td>
<td>45</td>
<td>37</td>
<td>18</td>
</tr>
<tr>
<td>Content Development</td>
<td>48</td>
<td>38</td>
<td>14</td>
</tr>
<tr>
<td>Technical Support Services</td>
<td>40</td>
<td>37</td>
<td>23</td>
</tr>
<tr>
<td>Interaction With Students</td>
<td>47</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>Administrative Activities</td>
<td>32</td>
<td>38</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: Survey results

Table 1 shows that the perception on learner support services reveals below 50% agreed with the learner support services which can’t be said as remarkable. Therefore, the first hypothesis has been disproved from this result.

Table 2: Relationship between Learner support services and students’ perception:

<table>
<thead>
<tr>
<th>Tutoring – Mentoring</th>
<th>Content development</th>
<th>Technical Support Services</th>
<th>Interaction with students</th>
<th>Administrative activities</th>
<th>No Feeling of Isolation</th>
<th>self direction and mgmt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.668**</td>
<td>0.576**</td>
<td>0.437**</td>
<td>0.576**</td>
<td>0.413**</td>
<td>0.437**</td>
</tr>
</tbody>
</table>

| Content development  | 1                   | 0.466**                   | 0.472**                   | 0.657**                  | 0.478**                | 0.468**                   |

| Technical Support Services | 1                   | 0.474**                   | 0.658**                   | 0.415**                  | 0.428**                |                          |

| Interaction with students | 1                   | 0.676**                   | 0.497**                   | 0.478**                  |                        |                          |

| Administrative activities | 1                   | 0.416**                   | 0.437**                   |                          |                        |                          |

| No Feeling of Isolation | 1                   | 0.578**                   |                          |                          |                        |                          |
Correlation test was made to examine the relationship between variables and results are tabulated. From the Table 2 the results revealed that there is a significant relationship between the Learner Support Services (LSS) and perception of the students at 0.01 significant levels. From this result the hypothesis 2 has been disproved because the relationship between the perception and learner support has the weak moderate relationship and it could be proved that the students feel isolation and lack of self direction.

### 5. Conclusion

From the above results it can be concluded students dissatisfy with their learner support services because they feel isolation, lack of self direction and management, unethical submission of assignments and lack of technical facilities etc. Insufficient academic support leads to them to withdraw from their course. Further, students’ performance depends on effective LSS and the possible suggestions from the study by getting feedback from the students that the facilities such as usages of modern technology i.e., using video conferencing, uploading power point presentation with sound recording and the advance instructions regarding examination and other face to face activities and the effective administrative procedures should be enhanced as LSS in order to improve the performance. And some strategies are highlighted as suggestions to improve the quality of the LSS in future.

When this delivery mode is new, student’s lack of access to support services such as advising, tutors, libraries and technical support, placed them at a disadvantage. It should be concentrated carefully by the faculty. Designing support services should be available for the online learning students, including support for admissions, registration, career advice, tutoring, academic advising, library, etc., will result in a more personalized approach for online students. This also includes groups formed between librarians, advisors, and technical support with teaching faculty, which can be essential in helping students complete their courses successfully. Technical support by telephone, email, online chat, or web-based tutorials, for both students and tutor-mentors, are crucial in limiting the extra burden of managing the technology along with mastering the course content. Students can refer to this support when they have difficulties on completing exams or submitting assignments, rather than failing to complete the required work. Failure of internet access and power failure should be eliminated in the Jaffna region.

### References

12. BBM Online Degree Proposal submitted to the DEMP Office, Memorandum of Understanding and other Faculty board, Senate Reports and documents.
13. Direct interviews with related staff and direct observations and experiences regarding the BBM Online Degree Programme.
1. Introduction

Teaching language to children with learning disability is a challenging area that always focuses on learner-centered approach. Many projects have been introduced (throughout different parts of the world) and innovations have brought changes in materials (supplementary, self-study, authentic, etc) and technology devices (language laboratories, tape recorders, video recorders, computers and software, etc). More recently, the use of technology as a tool to develop the different language skills has received great attention so that special educators as well as speech-language pathologists are frequently exposed to new practices.

1.1 Learning Disability

A learning disability (LD) is in most situations a “hidden disability” with no outward signs of a disability. Children with LD are those who have average/high intellectual ability but struggle in their academics. A learning disability is unique to the individual and can appear in a variety of ways. It may be difficult to diagnose, to determine impact, and to accommodate.

Learning disabilities usually fall within four broad categories:

• **Spoken language** - listening and speaking
• **Written language** - reading, writing, and spelling
• **Arithmetic** - calculation and concepts
• **Reasoning** - organization and integration of ideas and thoughts.

A person with a learning disability may have discrepancies in one or all of these categories. Often people with Attention Deficit Disorder/Attention Deficit Hyperactive Disorder (ADD/ADHD) also have learning disabilities.

People with an LD are often neglected when considering assistive computer technology. Regarding Tamil language no specialized software are available for language teaching for these children. Many people with learning disabilities can benefit from mainstream and specialized hardware and software to operate a computer and further their academic and career goals. As computer based teaching/learning involves animated features and interactive sessions with feedbacks it helps the children to hold in learning process for long time and rehearsal makes them to store the linguistic feature in their long term memory.

2. Aim

The present study aims to frame a methodology for developing software to teach various linguistic features in Tamil which are considered to be a problematic area for the children with LD. The linguistic features important for reading and its main problematic areas of these children are; sound recognition, phonological awareness, morphological awareness and vocabulary. So the present study frames a methodology to build software for above said features.

3. Methodology

The methodology to build software for teaching sound recognition, phonological awareness, morphological awareness and vocabulary in Tamil are as follows.
3.1. Sound recognition

a. Teaching to Recognize Rhyme

Teaching children to click appropriate buttons to locate sounds.

- One sound - will need to click the buttons with one picture.
- Two sounds - will need to click the buttons with two pictures (both the same picture to show that the two sounds were the same).
- Three sounds - will need to click the buttons with three pictures (all the same picture to show that the sounds were the same).

<table>
<thead>
<tr>
<th>Teacher says</th>
<th>Child shows the picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>k . . k</td>
<td>two picture, the same one</td>
</tr>
<tr>
<td>n . . p</td>
<td>two picture, the different ones</td>
</tr>
<tr>
<td>r . . r . . r</td>
<td>three beads, the same one</td>
</tr>
<tr>
<td>t . . r . . l</td>
<td>three beads, all different pictures</td>
</tr>
</tbody>
</table>

b. Teaching to Recognize Rhyme

Giving tasks like;

"Do these words rhyme? / paTam/, /maTam/
"Which of these words rhyme? /vaTTi/, /vaLLi/, /aLLi/

and the child has to click the buttons with words that sounds rhyming.

3.2 Phonological Awareness

Phonemic awareness is “the ability to hear, identify, and manipulate the individual sounds, or phonemes, in spoken words” a key for successful phonological processing. Phonemic awareness gets much attention in the field of literacy, in particular as an essential skill needed in the development of print literacy (Adams, 1990). The following are the phonological awareness skills.

- **Phoneme Blending** - to find the word made by blending the phonemes
  The picture of tree sounds five phonemes - “p-a-T-a-m”
  The fruit in the ground has words with 4, 3 and 5 phonemes – “p - a-m” “p-a-T-a” “p-a-T-a-m”
  Click on the fruit that has the word made by blending these sounds.

- **Phoneme Segmentation** - to find number of phonemes in a word
  The picture of a flower sounds a word with 4 phonemes - “k-o-T-u”
  The leaves in the ground has numbers 3, 4, and 2
  Click on the leaf that has the number of phonemes by counting the phonemes in the word

- **Phoneme Identification** – to identify the sound you hear at the beginning of the word
  The picture of a ball sounds a word - “karam”
  The bats in the ground has 3 different words–
“ram” “aram” “kal”
Click on the bat that has the sound you hear at the beginning of this word.

- **Phoneme Addition** - the word you get when you add a sound
  The picture of cup sounds a word - “eru”
  The saucers in the ground has 3 different words –
  “peru” “etu” “aru”
  Click on the saucer that has the word you get when you add a sound.

- **Phoneme Deletion** - the word you get when you remove a sound
  The picture of bag sounds a word - “naaru”
  The books in the ground has 3 different words –
  “naaRRu” “nuuRu” “aaRu”
  Click on the book that has the word you get when you remove a sound.

- **Phoneme Manipulation** - the word you get when you change a sound
  The picture of cup sounds a word - “aru”
  The saucers in the ground has 3 different words –
  “paru” “eru” “arul”
  Click on the ball that has the word you get when you change a sound.

- **Syllable Blending** – to find the word made by blending the syllables
  The picture of balloons sounds three syllable - “va” - “ru” - “vaar”
  The balls in the ground has words with 2, 3, 4 syllables –
  “voraar” “varu$kriar” “varuvaar”
  Click on the ball that has the word made by blending these syllables.

- **Syllable Segmentation** - to find number of syllables in a word
  The picture of a flower sounds a word with 4 syllables - “ko – Tu – KiR – aar”
  The leaves in the ground has numbers 3, 4, and 2
  Click on the leaf that has the number of syllables by counting the syllables in the word.

- **Sentence Segmentation** – to find number of words in a sentence
  The picture with 3 balloons sounds three words - “itu en peenaa”
  The balls in the ground has 4 words, 3 words and 2 words –
  “itu en peenaa” “itu peenaa” “itu en putiya peenaa”
  Click on the ball that sounds three words.

### 3.3. Morphological Awareness

Morphological awareness is defined as the ability to use the knowledge of word formation rules and the pairings between sounds and meanings (Kuo & Anderson, 2006) . With morphological awareness, learners are able to learn morphemes and morphemic boundaries by disassembling complex words into meaningful parts (e.g. kulantaikaLukku = kulanta + -kal + -kku), learning the meanings of roots, affixes (kulanta= baby, -kal= indicate plural nouns, -kku= to), and reassembling the meaningful parts into new meanings (peNkaLukku, iLainkarkaLukku, muthiyavarkaLukku) . The following are the phonological awareness skills.

- **morpheme identification** – find the segment of the words into meaningful chunks, we feed words (kulantaikaLukkukkaga) which can be divide into free and bound morphemes with function/meaning of each morphemes, first we teach free morpheme (kulantaI) with a picture, then with bound it (kulantaI – kaI) we have to add a picture of two or more children. Then children are taught to identify morphemes by giving the function/meaning.

- **to identify the sound you hear** – KiR (or function of morpheme)
  The picture of a ball sounds a word - “paaTukiRaan”
The bats in the ground has 3 different morphemes – “paaTu” “kiR” “aan”
Click on the bat that has the sound you hear at the beginning of this word.

- **Synthesis (morphological structure)** - find the word made by attaching the suitable morphemes.
  A root was given and there will be few markers are given as a choice, the child has to click the button with right marker. Pictures will be given as clue.
  example: itu oru pantu, mejaiyil iraNdu pantu ___ irukiRatu a) kal b) ai c) aal
  aNNan paTam varai _____a) kiRaan b) ntaaL c) kiRaaL

3.4. Vocabulary

a. **Homophones**

All homophones are presented with the context and with the help of pictures.
palli ‘lizard’ - cuvaRRil palli irukiRatu.
palLi ‘school’ - avaL paLLi celkiRaaL.
Tool tip can given to each word highlighting the meaning.

<table>
<thead>
<tr>
<th>palli ‘lizard’ – cuvaRRil palli irukiRatu.</th>
<th>paLLi ‘school’ - avaL</th>
<th>paLLi</th>
<th>celkiRaaL.</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image of a lizard]</td>
<td>![Image of a child holding a basket]</td>
<td>![Image of a child holding a basket]</td>
<td>![Image of a boy holding a bucket]</td>
</tr>
</tbody>
</table>

Exercise:
1. Matching context based picture.
2. Sentence filling.
   For example: avaL ________ celkiRaaL.
   i. palLi
   ii. palli

b. **Homographs**

All the homographs are fed to the computer. The context is provided with the help of pictures.

aaRu- muruganukku mugam aaRu.
aaRu- inta aaRRin peyar enna?
Exercise:

1. Context based picture
2. Matching the picture according to the context

**c. Meronyms**

All head words and related words are presented with picture. For example the picture of tree with a word ‘tree’ and its parts, are marked as branch, stem, fruit, leaves and root in the same picture. Zooming is provided to go further to view the parts.

Exercise:

1. Labeling the pictures.
2. Matching the words with the pictures.
3. Treasure hunt.
4. Concluding Remarks

The methodology provided above is a sample for each feature. As the problem of the dyslexics is to read normal text in printed form and as they have lot of distractions, computer aided interactive visualized teaching will be very effective to teach vocabulary to these children.

As these children have memory problems, this helps to store in long term memory as they are presented with pictures or animations. Also any amount of words can be given in each section and according to the time available to the students they can go through the entire list.

5. References

ABSTRACT

Primary schools are the first institution where children receive their early stage of compulsory education. Children in Malaysia require to attend primary school from the age of seven until the age of twelve. During this period the bag weight and the body weight ratio is likely to be high as some students are relatively small to carry loads similar to older children. In recent years, this issue caught the attention of few parents but the problem of proposition of bag weight to weight and height of children continuously haunts the parent’s mind without any form of solution to the problem. Hence the role of ICT are seek in order to shoulder the responsibility of enhancing the teaching engine which depend on traditional books to digital books. Modernizing the current Tamil school infrastructure should also be part of mainstream overhaul in order to create much healthier, safer and exciting environment to study Tamil. This paper address our research finding on possibility of long term health deterioration under gone by Malaysian Tamil school students. Recommendation will also be inked within this paper for better and safer studying environment for our students with improvement to current infrastructure.

1. INTRODUCTION

Primary schools are the first institution where children receive their first stage of compulsory education. Children in Malaysia require to attend primary school from the age of seven until the age of twelve. During this period the bag weight and the body weight ratio is likely to be high as some students are relatively small to carry loads similar to older children. In recent years, this issue caught the attention of few parents but the problem of proposition of bag weight to weight and height of children continuously haunts the parent’s mind without any form of solution to the problem.

2. PROBLEM STATEMENT

The Times Of India (2010) have reported that a scientific study has confirmed that heavy back packs carried by children aged 10-13 years can caused disability at later age. The Times Of India also reported that the study conducted by the Movement Analysis Lab of Srinivas College of Physiotherapy and Research Center in association with Kasturba Medical College in Mangalore on 200 school boys has found that bags weighing 5% of the body weight of child could affect the trunk and lower limb angle and those bags weighing 15% could change all angles pertaining to head, neck, trunk, and lower limb changing the overall posture of the child.

Couple to Times Of India report, article released by “Towards Queensland Tomorrow” says that students who carry heavy school bags may experience fatigue, muscle strain, back pain, distortion of the spine's natural curves and rounding of the shoulders. This fact has also been highlighted by S.Dockrellin in the same report that musculoskeletal symptoms are believed to be multifactorial and Whitfield (2001) states that the carriage of heavy schoolbags is a suspected “contributory factor” and therefore represents an “overlooked daily physical stress” for school children. Risk factors like musculoskeletal discomfort associated with school bag carriage include the combined effects of heavy loads, load shape and size, time spent carrying the load, position of the load on the body and walking up staircases with heavy loads.

A general guideline of 10% body weight, initially proposed by Voll and Klimt in 1997 continues to be the recommended guideline when carrying a back pack style schoolbag. The findings of more recent studies may challenge this guideline. The weight carried by students varies from day to day and studies have reported different results in regards to the average school bag weight. The different age range for students included in the studies may explain some of this variation, but irrespective of age there is a considerable number of school children carrying in excess of 10% of their body weight. Field data sample survey was conducted at a Malaysian school by surveying about 150 students from standard 1 to 6 of all available 5 classes at each standard. Following information were extracted from the survey:
1. Bag weight (kg)
2. Student weight (kg)
3. Student height (cm)
4. Interview student health condition
5. Book sizes (biggest to average book size)
6. Interview teacher on how to reduce bag weight
7. Measure classroom dimensions to identify suitable location to place the locker
8. Measure current table sizes to identify the method to retrofit the table

Scales and measuring tape were using as tools for measurements. An average of 5-10 students were randomly selected for the study from each class and standard.

3. SUMMARY OF FINDINGS

Few critical plots were made in order to simplify the data collected.

Plot 1: Student height and weight for all the standards.

![Plot 1: Student height and weight for all the standards](image1)

Plot 2: Student BMI, bag weight for all the standard

![Plot 2: Student BMI, bag weight for the entire standard](image2)

With the plots and analysis made the students found to be carrying much heavier weight than recommended in the studies reported in “The Time of India”. The bag weight should only be about 5% of the student weight, however the students are found to be carrying their school bag which is about 22.13% of their body weight much higher than recommended by Voll and Klimt (1997). Hence there is a good possibility of the students to have long term health problem related to spine due to heavy school bags. By analyzing the school classroom sizes and possibility of adopting locker system for each student, we found the following problem:
I. The classrooms are too small to place lockers of about 80 units (2 section, 40 students per section). Refer Figure 1.0.
II. Most existing furniture are desk without pocket.
III. It is unsafe to leave behind the books at the desk pocket without locker, as the next section student might displace the books.

Plot 3: Student weight, Percentage of weight of bag/ weight of student for all the standard.

4. DISCUSSION

Hence it is proposed to have segmented lockers of 5.3 feet long by 1.2 feet width and 4 feet high with rollers for easy movement within the class room. After taking into account average book size refer Figure 2.0, the proposed locker dimension with improved desk suitable for Malaysian school environment are shown in:
I. Figure 3.0 shows the stand alone locker system with wheels attached-suitable to move about. However not suitable for classrooms with space constrain.
II. Figure 4.0 shows the improved desk system with build in two slim lockers. This approach can be retrofitted into existing table and suitable for class rooms with space constrain.

A combination of the above two system can be adopted with a possibility of deducting 30% -50% of the student bag weight. Bringing down to tolerable bag weight of less than 10% of student body weight.

5. HEALTH CHECK AND INTERVIEW WITH TEACHERS

Based on the study it is found that the students are carrying bag weight 2 to 3 times heavier than recommended 5-10% of body weight. The ideal weight should be only 5% of body weight. The students at this early stage found to be not able to report fatigue, exhaustion and muscle weakness due to carry heavy bags. They are silently tolerating the mass in the excitement of going to school and to avoid being punished by teachers. In depth interview and health check is required to
be conducted to identify the long term health problem to the children. When a child complains of leg or hand pain or neck pain, the child or parents most likely advice the client to rest, without realizing it is the early signs of spine distortion.

Figure 1.0: The classrooms are too small to place lockers of about 80 units

(2 section, 40 students per section)

Figure 3.0 shows the stand alone locker system with wheels attached-suitable to move about.

Figure 4.0 shows the improved desk system with build in two slim lockers.

As for the teachers, reduction is bag weight is well received with the use of locker system. This could ensure the references or text books is always available for the teacher to utilize for teaching.
Plate 1 – Weight of students with their bags are scaled

Plate 2 – Size of bag is measured

Plate 3 – Total numbers of bag carried by a student

Plate 4 – Height of student is measured

Plate 5 – Shows the health consequences of carrying heavy school bags.
6. RECOMMENDATION AND CONCLUSION

Based on the study it is found that the students are carrying bag weight 2 to 3 times heavier than recommended 5-10% of body weight. The ideal weight should be only 5% of body weight. To prevent long term health damage of the children, it is recommended carrying out the following measures:

I. Teachers are recommended to guide the children what books are required to bring for the day or next lesson.
II. Parents are recommended to assist the students in preparing their school bags according to time table and teacher’s guide.
III. Heavy text and reference books, it is recommended to be left behind in school lockers.
IV. Propose to introduce lockers for each student within the classroom for reduce the bag weight
V. Introduce new standalone locker system as shown in Figure 3.0.
VI. Improve or retrofit the existing desk with pockets as shown in Figure 4.0.
VII. Perform combination of standalone locker and retrofit the existing desk in order to bring down the weight of school bag.
VIII. Avoid piggy riding work books – old completed work books are paste together with new work books to ensure continuity of notes, however this cause children to carry redundant weight causing the bags to be more heavier.
IX. Install access ramp, similar to OKU’s wheel chairs ramp in order for children to pull the bags on wheels over split platforms to avoid being carried over the staircases or walk long distances carrying the bags.
X. Introduce single section school in order for students to safely leave their books within their class rooms and reduce bag weight.
XI. Provide sufficient space at car parks or drop off area for bus and cars to to stop next to an access ramp to minimize bags being carried.
XII. Install easy to deploy and retrofit hydraulic lift for building blocks higher than 2 floors (ground floor and first floor).
XIII. Recommend school building not higher than 2 floors (ground floor and first floor)
XIV. Allow for larger classrooms to fit in built in lockers
XV. Implement teaching system using ICT.
XVI. Digital notes and exercise books using tablets will be able to reduce bag weight.

With all the above recommendation we believe the long term health of the children can be safe guarded. Plate 5 shows the health consequences of carrying heavy school bags.

REFERENCES

Developing a Linguistic-based Tool for Teaching and Learning of Tamil Verbs

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Introduction

The things referred to by language are never merely things of the phenomenal world which can be demonstrated with the help of technology i.e. *science*. A large number of things are feelings, ideas, and values. In fact, the words in a language are so loaded with feelings and values that social scientists feel, sometimes, the necessity to devise a science, like mathematical science, which has signs with no such load to carry. Social phenomena like group solidarity, reference groups, and host of others are fostered through the help of a language though other group distinguishing signs are also often used. The load of meaning and emotion carried by words is sometimes made very explicit in the grammar of language. Thus, this paper tries to focus on teaching and learning of Tamil verbs which express the different moods of the speaker or writer.

Aim

The aim of this paper is to develop a linguistic based tool for teaching and learning of strong verbs in modern Tamil.

Objectives

The objectives of the developed tool are to make the students or learners:

- understand the concept of Tamil verbs and their structures.
- learn the different inflected forms of a verb such as finite and non-finite forms.
- know the various functions of verbs.
- prepare themselves at their earliest stage to work with computers and to compete with the technological challenges in the electronic educational set up.
- enhance their knowledge on verb paradigms in Tamil.
- stimulate them to learn eagerly by the immediate feedback of their learning activities.

Methodology

For the present study, about 40 strong verbs in modern Tamil have randomly been collected from the school text books as source data. The collected data have been analyzed linguistically to find out their components which are internally organized systematically for framing their structures. Finally, the linguistic information on verbs have been computed by applying the programming frame work namely VB.Net.

Discussion

Verbs in modern linguistic world are defined as one of the grammatical elements of speech that are used to express conceptualizations of activities, events, processes or states. In Tamil, they function morphologically and syntactically in three ways as follows:

- **As finite verbs**: As far as Tamil language is concerned, there are three types of finite verbs namely *imperative* (i.e. vaa / vaarungkaL ‘come’, *indicative* (i.e. vantaan ‘came-he’) and *optative* (i.e. varuka ‘welcome/come’). They are distinguished according to the category of mood.
• **As non-finite verbs:** They function syntactically as adverbs, adjectives. E.g., here the verbal participle vantu in vantu poo and cenRa in cenRa paiyan cannot be syntactically considered as adverbs and adjective, respectively. But cenRo in cenRo aanTu and taLLi in taLLi ni are considered as pure adjectives and adverbs respectively, since they qualify the noun as well as the verb which follow them.

• **As derived verbs:** The transitive verb naTattu ‘conduct’ and the causative verb naTappi ‘make to walk’ are derived from the intransitive verb naTa ‘walk’. Similarly, the causative verb tooRRuvi ‘cause to appear’ is also derived from the inherent transitive verb tooRRu ‘make to appear’.

The principal inflectional categories occurring with verbs appearing in the finite forms are tense, aspect, mood, gender, number and person, whereas in non finite forms are infinitive, verbal and adjectival participles, etc.; and they employ representations for syntactic category and semantic- syntactic function. For instance,

*avan puttakam vaangka kaTaikkuc cenRaan.*

‘He went to the shop to buy a book’.

The non finite verb vaangka ‘to buy’ which is morphologically treated as infinitive but it is syntactically used for expressing the meaning of *purposive* that is known as semantic-syntactic function. But the developed tool highlights the inflectional forms of the verbs which express not only various functions but also the different moods such as:

- **Indicative:** It, however, is not completely devoid of emotional load as the context in which it occurs the tone in which it is uttered, might give it this weight.
- **Imperative:** The imperative as the name suggests, calls before our eyes a social situation of superiority and subordination, one of the most fundamental of social situations.
- **Optative:** This suggests an option and therefore a freedom to do or not to do a certain act. When the words talaivar avarkaLee varuka! are uttered, the form varuka ‘come - optative’ brings about a desire in the heart of the speaker to welcome the talaivar ‘a leader’. The form talaivar avarkaLee ‘third person epicene most honorific singular’ which is loaded with social values, all that is sectioned and, do a certain extent, sanctified by the society, because the form avarkal ‘they’ does normally not refer to singular. This form represents the whole value framework of a society. That the language should have recognized the various forms of verbs shows the range of social function which language fulfills.

The developed tool consists of four things such as,

1. Verb Classification
2. Concept of Verbs
3. Verb Classification with examples
4. Exercise

The visual is given below.
1. **Verb Classification**: It deals with how the verbs are structurally as well as functionally differed from one another. It simply shows the traditional classification of the Tamil verb. The illustration of the program has various states which are visualized in the following screenshots.

**Visual-1**

**State-1**

This is the starting state at which the teaching and learning process of the verb classification begins. When the term *verb* given in the visual -1 is clicked, it moves to next state that performs the results displayed in visual-2.

**Visual-2**

**State-2**

In this state, the basic classification of verb such as finite, non-finite and defective verbs is depicted as it is given in the visual -2. When the terms displayed in this visual are clicked, it moves to the next state where the results are displayed.

**Visual-3**

**State-3**

This state shows the results of the previous state, that is classification of finite verbs namely tensed and non–tensed which come under the term *Finite*. In this state, when the term *Tensed* displayed in the visual -3 is clicked, it goes to the next state.

**Visual-4**

**State-4**

This state depicts the results of the previous state that is the classification of the Tensed (finite) verbs which refer to the three tenses such as present, past and future. When the term *Non-Tensed* visualized in the visual -4 is clicked, it is moved to next state.
2. Concept of verbs

This part is divided into two sub-parts. The first one consists of the terms of the verbs. The second one contains the definition and the structure of the various verb terms given at the first part. This part describes the components of the verb, and then how the components are internally well organized as well as structured to form different forms of a single
verb. The terms which have to be defined are given in the left side. When the term is clicked, the definition, and its structure with example are displayed in the right side. The sample visual is as follows:

This part highlights what is the maximum quantity of the inflected forms of a single verb according to the above mentioned classification. The root verb bank is placed at the left side. While clicking any of the root verbs given in the bank, the maximum quantity of the inflected forms of that particular verb is displayed. It is shown in the following sample visual.

In this part, a few of the inflected forms are randomly given for identification of the term of form. If the verb form given in the list is clicked, multiple choices are displayed. When the correct answer is clicked, the mark is automatically scored. When the wrong answer is clicked, it shows the correct answer. This is simply for testing and evaluating the students or learners, and also for having feedback.

It has three states; the first state contains a few of the inflected forms which are randomly chosen from the database developed for this tool. When any of the forms is clicked, the choices are displayed. If the correct answer is clicked, the marks are scored. If the wrong answer is clicked, the statement ‘It’s wrong’ is displayed with answer. The visuals of these three states are as follows:
Conclusion

This simple tool will definitely stimulate the cognitive power of students; and will be not only a virtual learning but also a teaching tool in promoting up a student’s or learner’s knowledge on Tamil verbs with their functions and structures.

References

Mobile Learning as support to Tamil Language Teaching

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Introduction

One of the potential technologies deemed suitable to play a fruitful role in this regard is mobile learning. Portability and accessibility of mobile devices in this digital era have attracted many scholars to apply them in the educational settings. Furthermore, several researchers have attempted to prove the applicability of mobile learning as modern ways of teaching and learning (Naismith, 2004). Moreover, applying portable technologies have been demanded by most of the modern learners who oftentimes are forced to study anywhere and anytime, for example, at work, in the bus or at weekends (Evans, 2008). The wireless portable devices such as iPads, MP3 players, smart phones (like Blackberry, phone), and Personal Digital Assistants (PDAs) could provide opportunities to respond to the need of this generation. Evans (2008) believes that a distinguishable feature of mobile learning or M-learning is the potential to study when traveling on transport. Language learning is also expected to benefit from the extensive possession of mobile devices such as phones and media players (Kukulska-Hulme, 2006). In addition to the above mentioned profits of M-learning for learners that can be attributed to TLT learners too, teachers may benefit from applying portable wireless devices through their teaching process. To increase access to authentic teaching and learning subjects, mobile technology can be used mainly by teachers even when they are traveling to schools or arrange lesson plans.

Technology in Language Teaching and Learning

"Technology has accompanied the process of language teaching and learning for many years. Cassette players and television were traditional primitive technological tools, which were used in language classes as pedagogical aids. Today, when we think about technology, the first teaching aid that appears in our vision is computer. Likewise, in the field of Tamil language teaching, computer is a good teaching aid, especially since it has been complemented with the connection to the Internet. That is why a great deal of studies has been carried out to investigate the effect of computer-based or web-based language learning in the educational environments. Educators have also recognized the potential of technology as an instructional tool in language teaching and its application is increasing too. They asserted that technology is able to generate either collaborative or independent learning environment in which learners can practice and learn a new language. Combination of technology into language education has become a daily event, and the educational multimedia courseware is produced largely as reference subjects to promote Tamil language teaching and learning. Moreover, usage of the Internet in language teaching has been considered a serious methodology. Hismanoglu (2010) emphasized that besides its technological function, the Internet can also be used as a pedagogical tool for improving language learning and teaching. The recent Internet-based technologies employed in foreign language instruction is Web 2.0 tools. The most common tools of Web 2.0 include wiki, blog, podcast, social network and video conferencing have demonstrated the capability of the current technology in language teaching and learning. Studies have revealed that wikis are useful tools for learning and teaching as they provide collaborative writing (Cress & Kimmerle, 2008). Likewise, blogs or text formatted journal entries by users, can improve writing skills, promote active learning, and provide feedback for students and teachers (Alexander, 2006; Seitzinger, 2006). Language learners normally use blogs in their classes to enhance both writing and reading skills (Sarica & Cavus, 2009). Apart from wikis and Hogging, social networking is a good opportunity for language learners to improve their writing and reading ability especially when they type messages or read them (Sarica & Cavus, 2009). Lam (2000) confirmed the potential of online messages to boost the writing ability of language learners and stated that online exchanges and discussions via the web and email messages may enhance the students’ writing skill. Language teachers were the first to acknowledge the benefits of the application of social networking tools in language learning.
Mobile Learning

The creation of mobile devices such as cell phones, PDAs, iPods and pod cast has demonstrated that technology-based pedagogy is employed rather extensively in some academic environment. Although mobile learning is gradually being accepted in not many educational settings, its advantages cannot be overlooked. Mobile learning is defined as any service or facility that contributes to acquisition of knowledge regardless of time and location. According to Vavoula and Sharpies (2002) learning can be considered mobile in three different contexts: learning is mobile in regard to space, it is mobile due to the different places, and it is mobile in terms of time. Hence, mobile learning system can deliver education to learners anytime and anywhere they need it. M-learning is limitless in terms of the content and geographical extent, so, this offers dispersed virtual classrooms accessible any time (Jalalyazdi, et al, 2009). Another variety of M-learning which is applied exclusively for language learning is called Mobile assisted language learning (MALL). Although, this is an illustration of technology-based language learning, it is different than computer assisted language learning (CALL) because it focuses on the "continuity or spontaneity of access and interaction across different contexts of use (Kukulska-Hulme, 2009, p. 162). The novel model of mobile learning creates various learning environments since students can download applications synchronously or asynchronously. They can also access notifications, weekly activities, feedbacks, assignments, their courses, online libraries, grading reports and these have increased their interest in studies (Kristoffersen & Ljungberg, 1998). Individual learners who are engaged in this type of learning can personalize their learning environments by deciding where and when to learn. Furthermore, to develop mobile learning activities, instructional designers should pay special attention in creating and managing the knowledge database such as the vocabulary databases, reading materials, and learning materials including audio or video files. In the meantime, accessibility and technical connection problems are the most important considerations (Park, 2011). Chang (2010) claimed that mobile learning’s an audio-based learning project that allows learners to participate in the asynchronous learning discussion on mobile devices instead of the text-based discussion. In other words, learners can download audio files recorded by their peers and listen to these recordings while on the move. Since multimedia message services (MMS), an evolutionary form of short message services (SMS), can send not only text but also graphics,

PDAs

Personal Digital assistants (PDAs) are pocket-sized computers that are expandable with some hardware components like keyboards and wireless networks and can be equipped with software programs such as word processors, flash-cards, databases, and bilingual dictionaries (Houser, et al., 2002). Chinnery (2006) asserted that one of the primary roles of PDAs has been as a translator in a language-learning classroom. Other than that, software programs such as ‘MobiLearn’ have managed to convert PDAs into ‘talking phase books. In addition, various projects have been implemented for using PDAs in language learning environments.

Cell phones

Short Message Service (SMS), voice-messaging, cameras, video-recording and even Internet access for cell phone users are practical for language learning. Chinnery (2006) believed that all of these features allow language teachers to offer access to authentic content, communicative language practice, as well as completion of tasks to the students. A cell phone is the most popular and accessible mobile device in language learning as it is widely used by individuals regardless of their age and gender. Houser, et al. (2002) quoted the results of a study performed by Stanford Learning Lab on learning language via mobile phones. They provided some programs including translation of words and phrases, vocabulary practice, access to live talking tutors and quizzes. The findings of the study revealed that mobile phones were effective for quiz delivery carried out in small segments. It also concluded that quizzes and voice vocabulary lessons had great potential in the teaching and learning of language.

Conclusion

This paper has highlighted how to support a variety of mobile devices in the educational delivery, particularly in the field of TLT. Mobile devices like other technologies, at first appeared peculiar for pedagogical use but slowly, they have become a part of our life. Great changes in utilizing PDA, and cell phone for the teaching and learning of languages have proven the potential of mobile technologies. Furthermore, related literature has identified the adoption of this technology by language teachers. Portability and wide access to mobile phones have made it more popular in education.

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A computer is perhaps more excellent than a mobile phone "for handling various types of information such as visual, sound, and textual information, but mobile phone is superior to a computer in portability (Yamaguchi, 2005). Hence, the integration of mobile learning with Tamil teaching and learning may offer vast innovations in the coming days. Even though the utilization of mobile learning in TLT is not common in many countries, such educational setting seems a fashionable path in language learning. Mobile learning applications in language learning has its advantages and its potential should not be overlooked, for, the future holds great possibilities for this type of technological device for pedagogical use.

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Computer Assisted Tamil Language Teaching Tool
“Tamil Learning Mantra”

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ABSTRACT

Language is the soul of communication and Computer is the heart of Technology. The borders of the world can be broken by combining the computer and language together using the help of computer assisted language teaching. The interest in learning a new language became less among the people in this world due to not awareness about that new language and no proper translation through a known language. Recent years, people has shown a boom of interest in using computer for language learning and teaching, but the roles of computer in teaching Indian languages is very less, that also its too less especially for Tamil language comparing to other Indian languages. In this paper we present the basic Tamil language teaching tool “TAMIL LEARNING MANTRA”. This Tamil teaching tool (TLM) is used to help the people across the foreign countries and also in other states of India to learn the basics of Tamil language. It is used as an aid to learn Tamil very easily and quickly for all categories of people.

INTRODUCTION

Tamil Language teaching tool is mainly used to perform a mode of teaching the Indian language Tamil to people of other states and countries around the world. It assists the people to learn the Tamil through the global language English. The teaching of language begins with the basic concepts such as, letters of the language from vowels, consonants and combined vowel consonants. The words which are commonly used in Tamil language are categorized into different groups and each word is pictorially represented for easy identification. The sentences are given as combination of basic phrases and words. It is simplified for better understandability. More interactive teaching techniques have been handled in this tool. it plays a major role in spreading the wings of Tamil language across worldwide.

EXISTING SYSTEM STUDY

The existing systems available for teaching Tamil are very less comparing to other languages in India. Among them few tools are available for Tamil conversion and typing alone. There are also some mobile applications available for Tamil learning. Many online websites are also helpful in teaching Tamil.

DRAWBACKS IN EXISTING SYSTEM

Offline systems

The offline tools are only capable of teaching the Tamil language generally without the deep knowledge of its concepts. These tools help people to learn Tamil language letters and words through the Tamil only, it does not use any other language to give its equivalent meaning. This does not help the people who are unaware of Tamil. The interface used is not very friendly for all categories of users. It just helps to navigate from first word/letter to last in sequence order, which cannot be flexible in picking a intermediate word/letter. The most important drawback is these tools do not help in providing the direction and method of writing the letters. They provide only the whole letter as it is. Only the basic letters are covered with limited examples. No steps taken to test the knowledge of the language for people who completed learning it. Some tools used to teach Tamil through other Indian languages which is useful only for a group of people belong to that particular language limit so it is also not useful worldwide. Only minimum numbers of examples are given for letters so the learner does not know the proper usage of letters in creating words. The another main drawback is the learner suffers in pronunciation of letters and words, which is very important to learn a language.
Online systems

These types of tools are only used to learn Tamil by online only. It needs an internet connection for learning. Some of the websites provide only lessons of Tamil language concepts rather than interactive teaching. Most of websites are under some universities and it is only adaptable for adults and not for children for learning. Although some websites have good teaching methodology, most of the times it generates error due to server problem in loading the animations and becomes very slow. Additional plug-in and add-ons are required to load the multimedia components in the web pages. Most of websites concentrate in teaching the stories and rhymes only, not on the language concepts.

4. PROPOSED SYSTEM

The propose Tamil teaching tool is used to teach the Tamil language from the basic level. It provides more flexibility to learners. This tool teaches the language to people with more examples and clear pictures for each. This is basic level teaching version which covers the basic letters, words and sentences. It concentrates on giving the best to learners by proper step by step process of teaching. The letters are taught at first and the words are developed by letters, then sentences are taught finally. It attracts the user with its colorful interface and animated components.

ADVANTAGES IN PROPOSED SYSTEM

This Tamil teaching tool is used to teach in attractive manner by using the writing methods. Each letter is animated to show the direction of writing it. This helps the learner to write the letter very easily. The pronunciation of the letters and words are given in English. Along with that, it provides the equivalent English word for the given Tamil word. The audio is played to pronounce the given word in Tamil as well as in English. This helps the users to speak the words easily. The learner has a facility to hover on the letter or word to hear the pronunciation of it. A huge variety of topic is covered in words such as animals, birds, colors, and all other normal things around us. The sentence teaching consists of the basic phrases, two words and three words sentence and finally simple sentences. The listening skill is enhanced by using the audio which can be heard by means of speaker or microphone to listen to the words and sentences. The writing skills are also enhanced by this tool. It provides a wide range of printable materials for letters, words and sentences in the form of pdfs. The learners can do writing practice by writing over the printed patterns of each letter. The Quiz section is another interesting part of this tool. It allows the learner to take a test in categories such as verbal quiz and image quiz. The verbal quiz has verbal question with multiple choices and the learner should select the correct answer. The image quiz consists of multiple choices as images and the correct image for given Tamil word should be selected by the learner. This tool provides a user friendly and interactive environment for learning. It overcomes all the drawbacks of existing system by providing audio for pronunciation problem, examples for easy learning and quiz for evaluating learner’s knowledge. It also help in learning the writing methods which help learners to write by themselves without any help from others.

COMPONENTS DESCRIPTION

The Tamil teaching tool (TLM) consist of the components for teaching letters, words and sentences. It has additional components for enhancement of listening skills and writing practice. The description of each component is given as follows.

BASIC LETTERS

The component is used to teach the basic letters of the Tamil language. It consists of teaching the vowels, consonants and combination of vowels with consonants. The Tamil language consists of 12 vowels, 18 consonants and 216 vowel consonants. The component has letters with the example in Tamil and in English. The pronunciation of the letter and its example is displayed in English language. The learner can hover on the list of letters to display it animated writing method, example and pronunciation in both written and audio play back format. The learner can use the operational buttons to hear the audio of pronunciation, to print the material and to take writing practice from the single component. The GUI for teaching consonants is given in fig.1

BASIC WORDS
The words which are used commonly and the important for communication is categorized into animals, birds, food, fruits, vegetables and all basic categories. The learner can select any one category at a time and can learn the wide range of words in that particular category. The teaching is made interesting by using the colorful images related to the words and audio of the pronunciation. The word is written in Tamil as well as in English for easy understanding. The GUI for word categories is given in fig.2 and teaching under one category is shown in fig.3, 4.

USER INTERFACE DESIGN
SENTENCES

The sentences are taught from the basic phrases of language and then towards the simple sentences. The basic phrases are covered from the common used phrases and relationship words. The two words sentences are formed from the simple words. The three word sentences are also similar to two word sentence. Each sentence has the audio format to give the pronunciation of it in Tamil. The GUI for sentence teaching is given in fig.5.

LISTENING COMPREHENSION

The listening is very important to carry out a proper communication with a language. The learner must have capability to listen to the pronunciation to improve the speaking skill of a language. This teaching tool for Tamil language provides a wide range of words and sentences to help the learners to enhance the listening skill. This tool gives a very user friendly interaction to listen the word and sentences just by hovering over it. The GUI for listening skill enhancement is given in fig.6.

Fig.5 GUI for teaching sentences Fig.6 GUI for Listening skill enhancement

WRITING COMPREHENSION

The writing practice is very essential one to learn a language completely. The Tamil learning mantra allows the learner not only learn using the application but also using the hardcopy. It has the Tamil language concept in the form of printable materials. All the letters such as vowels, consonants, vowel consonants, words and sentences are created in the form of handwriting material with the sample patterns. The material is in the form of pdf. The learner can just select the related concept and take printouts. Now the learner can refer the original letters and overwrite on shaded letters for improving the writing skill. The alternative method to make the children who learn Tamil is to make them interesting with the help of writing using mouse. The set of colors is given and one can select any color and use mouse to write over the given shaded letter in the screen. This makes children to learn more enthusiastically. The GUI of writing practice is shown in fig.7, 8.
QUIZ FOR EVALUATION

The final component of this tool is the quiz which is used to evaluate the knowledge of Tamil language the learner gained from learning it using this tool. The quiz is separated into two type’s namely verbal quiz and image quiz. The verbal quiz it deals with the verbal questions given in English and a related image is displayed for identification of the given question. The multiple choices of Tamil words are given. The learner has to choose the correct answer. The answer should be the Tamil word for given English word in question. This component is not only for evaluating the learner but also help them. When the learner select an answer from given choice it immediately intimate them whether it is correct or wrong. If the answer selected is wrong then it displays the correct answer near the intimation. This helps the learner to understand the meaning and correct their mistakes. The GUI for verbal quiz is given in fig.9.

The image is quiz is similar to the verbal quiz but it has the difference in the choice. The question is given in the Tamil and three images are given as the multiple choice. The learner has to select the correct image for the given Tamil word in question. This also helps the learner when he/she select an answer from given choice it immediately intimate them whether it is correct or wrong. The GUI for image quiz is given in fig.10.
CONCLUSION AND FUTURE ENHANCEMENT

The Tamil teaching tool Tamil learning mantra is an interactive tool for learners to learn Tamil with the help of animation of writing method, voice playback for improving pronunciation and wide range of sample words. This will give a good experience for users to learn Tamil very quickly and easily with the Quality of the original Tamil. This tool is a basic version which covers only basics of Tamil language. In future it can be enhanced to teach the next levels of teaching Tamil such as complex sentence, passages, essays and conversations and finally the full fledged Tamil reading and speaking skills. It may also be used with machine learning and natural language processing to facilitate users to directly interact with computer for communication. This tool can also be enhanced to touch technology and used for the touch screen devices to make Tamil learning more effective and easy. Let this tool be one of the stepping stone for the oldest language in this world, to reach the people through the newest technology.
Developing Tamil Writing Skills: A Computational Approach

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Introduction

Today, computers are extensively being utilized for natural language processing particularly for data storage, computation, and communication. It is a tool for solving a wide range of problems. It is obvious that students have difficulties in understanding the concepts of various functions of words at sentence level. The difficulties vary from individual to individual. In order to make teaching and learning process effective, it is essential to find out learning difficulties of students during instructions.

This paper provides a brief overview of how computers have been used and are being used for developing writing skills. It focuses not only on a technical description of hardware and software, but rather on the pedagogical questions that teachers have considered in using computers in the classroom for developing writing skills. There are four language skills, namely, Listening, Speaking, Reading and Writing. But this paper mainly concentrates on developing writing skill only.

Objectives

- To improve teaching and learning by using the computer as a tool that can enrich existing teaching practices and open up new ways of presenting linguistic information.
- To promote a self-determined learning instrument that can be used collectively at school, as well as individually at home.
- To increase motivation by supporting a decision making and problem solving activities.

Thus this paper aims to develop a computerized learning and teaching materials for improving five different writing skills as follows:

- **Narrating**
- **Describing**
- **Interpreting**
- **Form filling**
- **Preparing applications and bio-data**

a. Narrating

We narrate past events. This skill gives us the ways to share our experiences. This leads to the development of stories. By developing our narrating skill one can become a good *story writer*. Most of the narrations are in past tense which indicates past events.

Activity 1

| nii ippadippil evvaaRu ceerntaay enpataik kuuRa mudiyumaa? |
| Can you narrate, how did you join this course? |
| Or |
| unatu naNpan kalluuriyil evvaaRu ceerntaan? (maruttuvam, poRiyiyal, piRa kalluurikaL |
| How did your friend get admission to the college: Medical or Engineering or other colleges? |
Help!

Write down first all the steps you have taken to get admission in simple sentences and then write connected account of the same.

Activity 2

(meelee kuuRiyatiiyee) nii kalluriyil mihamv kasTappaTTee ceeraveenTiyiruntatu enpatai iRantakaala etirmaRai vinaikaLaip payanpaTuttik kuuRuka.
Can you convert your write-up into a difficult process of getting admission by using past negative constructions?

Activity 3

Dr. Rajkumarai viirappan kaTattiya nikaLcci allatu atu poonRa veeRu kuRRaviyal nikaLvinai vivarikka mudiyumaa?
Can you narrate the incident of abduction of Dr.Rajkumar by Veerappan or any other recent interesting incident that attracted you?

Help!

Collect the stories from newspapers and then try to narrate the incidents.

Here are a few questions you may try to answer them.

1. When did the abduction take place?
2. enkee? Where?
3. At what part of the time?
4. What happened immediately the next day?
5. What followed next?
6. Why did the Chief Minister meet?
7. What were the demands made?
8. What were the reactions followed then?
9. How about Dr.Rajkumar’s life in the jungle?
10. What was Nakkeeran Gopal’s role in this episode?
11. When was Dr. Rajkumar released?
12. How was he released?
13. What happened them?

Activity 4

Nnarrating life history. This is an important skill. Every one of us has this experience of narrating the life of some historical/political/scientific leaders of the world. How sincere we are? How do we collect the information?

Step 1

Collect all events in the life of that particular leader.

Step 2
Rearrange the events in the correct chronological order.

Step 3

Put your sentences together to make connected accounts. Convert your simple sentences into compound and complex ones using connectives, conjunctions, etc.

Step 4

Does your narration give a complete outline of the leader’s life? If not, what do you require?

Step 5

Discuss with your friends.

Read their creations. Rewrite your own, if required.

Activity 5

Can you write a few sentences on the life of Jawaharlal Nehru?

Activity 6

Can you describe ‘how to prepare tea/coffee/sweets’?

Help!

1. Note down the different items necessary for the preparations.
2. Write down the steps – how it can be prepared.
3. Are there different steps or put everything together and prepare coffee/tea/sweets.
4. You may even discuss this with your friend/friends.
Activity 7

piRarukku ciRu veelaikoTuppatu enpatum atanai curukkamaay, teLivaay colvatenpatum oru moLittiranee. unatu kuLuvinarutan kalantu peeci kuRippleTuttukkanTu, iru cakkaraavNTiyeep paLutupaarkka viiTtin mun kuuTattaic cuttappaTutta piRarkku nii kuuRum kaTTaLaikaLai eLutuka.

Giving instructions precisely, clearly, is another skill that we have to develop.

Discuss now with your group and note down the steps that you have to take to give service to your scooter, or clear the hall of your house.

Activity 8

teeappaTam paarttup paTittaRital- taRaippaTattaik koNTu oru kuRippiTTa iTattai aTaivataRkaana vaLimuRaiyee naNpanukkuk kuuRutal

Map reading, giving instructions to your friends to reach a place using a map.

The road map of Chidambaram is given to you. You give instructions to your 3 friends to reach their destinations –

Friend 1 in the railway station wants to reach Nataraj Temple.

Friend 2 in the Rajendran statues wants to reach Pichavaram.

Friend 3 in the Gandi status wants to reach Dept. of CAS in Linguistics.

Help!

You may start like this ........

When you come out of the Railway station you will find a statues to your left and a diverson Annamalainagar Road; take the road when you start walking, to your right will be railway office and to your left will be a Rajendran statues so on.

Activity 9

Describing maps is an important task. Not only they give knowledge of the location, but also make you familiar with different places.

| oree nilappakutaarnta iru taraippaTankaLaip paarttu puRavaLiccaalai, vaLaiyappaatai aakiyavaRRai vivarikka muTiyumaa? avaRRiRkiTaiyee uLLa veeRupaaTukaL enna? ivaRRil etu ciRantatu?
| Can you describe the two maps given to you on the same point, namely, outer ring Road? What are all the differences?
| Which of the two is good?

Activity 10

When we describe a building, we normally do so in relation to the things near it, or the building/familiar to us.

The following words are often used.

in front of adjacent to there is opposite on the right of there are by the side of across behind on the left of
Activity 11

Like building, when you want to describe a house, how will you do that?

Help!

Here is a list of words useful for you.

- ground floor
- bedroom
- garden
- dining room
- first floor
- toilet
- compound wall
- floor area
- second floor
- bathroom
- hall/drawing
- puja room
- staircase
- room
- balcony
- wardrobe
- kitchen
- cupboard
- showcases
- closet

Activity 12

Oru ceymuRai/ ceyalmuRai vivarippatu

How to describe the process?

In most of the scientific writings this is very common. In most of the Chemistry, Physics classes, one may notice the use of passive sentences. We may use passive sentences when we are interested in what is done, how it is done than who did it, in other words, it is impersonal.

Take for example

- Almost all grains are cultivated in villages only.
- The grains are procured from villages.
- The grains are cleaned.
- The grains are bundled.
- The grains are stored in protected places.
- The grains are distributed to the people through PDS.
- The grains are purchased by people

Observe the sentences, which may be listed as below:

The grains -------------------------------

are cultivated
All are **passive** sentences. We understand who does all these things: Yes! The Government. We do not bother much about who does it but bother about what is done. Whenever you describe processes and whenever you are concerned with the thing done, you can use passive sentences.

Observe the **active-passive** sentences.

a) The people cultivate grains in the villages.
b) Grains are cultivated by the people in the villages.

**Note:**

There are a few steps to transform *an active sentence into a passive*.

**Step 1**

The **object** of the active sentence becomes the **subject** of the passive sentence.

**Step 2**

The **subject** of active sentence becomes the object of the preposition “by”

**Step 3**

The **verb** is transformed as

“BE” + past participle form of the verb

(The verb has to agree with the new subject)

Grains are cultivated by people in the villages.

**Step 4**

Delete the agent if not necessary.

**Activity 13**

Here is a flow chart of Teaching – learning process
Activity 14

Take any process of your choice and describe it.

Help!

a) How is a T.V. serial made.
b) How is water purified and distributed.
c) How is milk supplied.
d) How do letters reach the destination.
e) Select a candidate for a post etc.

1)

Ettanai ceyappaaTTu vinai vaakkiyankaLaip payanpaTuttamuTiyumaa attanai vaakkiyankalaiyum eLutuka
Try to use as many passive sentences as possible.

2)

eLutap poovataic caarntu manattiraiyil oru kaaTciyee uruvaakkikkoLka. piRarkaruttaik keeTTu, naNparkaLitam kalantu peeciyum pinnar eLutuka
Make a mental picture of what you are going to write. Take prompts and discuss with your friends and write.

Conclusion

The attempt made is very essential as well as important to note that ‘linguistics’ represents only one of the parameters and its use is indirect way of teaching language. It is supposed to give the language teachers, course designers, and producers of materials an inside view of the organization of language teaching and learning.
Reference

ROLE OF ELECTRONIC DICTIONARIES IN TAMIL LANGUAGE TEACHING AND LEARNING

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Introduction

Lexicography is the discipline concerned with the principles and methods of preparing dictionaries. It is an applied field, whose theoretical background is partly utilized by linguistics. Almost all the branches of linguistics provide information in making or writing a dictionary. Dictionary is a simple tool which helps us to pronounce, respell and check grammar. It gives meanings to words which cannot be understood or words that have more than one meaning. Besides meaning, it also provides information on the reader syllables, intonation and pronunciation of words. Dictionaries are considered practical sources of information that learners and teachers can depend on. Dictionaries could take different formats like traditional paper dictionaries, handheld electronic dictionaries, CD ROM dictionaries, online dictionaries depending on the purpose of their required usage. Dictionaries have become very important tools in language learning especially the new forms of electronic dictionaries. A good dictionary and dictionary skills are the pillars of language learning. Several technological developments have led to the invention of electronic dictionaries in the operational processes of teaching and learning in TTL. Careful consideration should be paid to the rules and precautions of using them and how to avoid any possible drawbacks. Teachers need to play a considerable role in facilitating dictionary usage in class activities to enhance the teaching/learning process.

Electronic Dictionary

The term electronic dictionary can be used to refer to any reference material stored in electronic form that gives information about the spelling, meaning, or use of words. Thus a spell-checker in a word-processing program, a device that scans and translates printed words, a glossary for on-line teaching materials, or an electronic version of a respected hard-copy dictionary are all electronic dictionaries characterized by the same system of storage and retrieval. It is the retrieval system, rather than the information content, which makes electronic dictionary use such a revolutionary experience compared to the consultation of a hard-copy dictionary. Books organize information in a primarily linear way, which is appropriate for the listing of a succession of separate entries, but inadequate as a means of grouping and regrouping words according to their semantic and pragmatic similarities, their valency and collocational patterning, or simply their letter combinations. The A-Z sequence places headwords in an order which is virtually meaningless, shedding no light on the relationships between words that are alphabetically distant, and complicating searches for phrases and idioms. A text search of an electronic dictionary, on the other hand, provides almost instant access to groups of words in any information field created during its development.

Thus the Oxford English Dictionary on CD-ROM can act, among other things, as a synonym finder, a dictionary of quotations, or a terminology bank, simply through the rearrangement of the information which is provided in the original paper-based text. Similarly, several learners’ dictionaries in electronic form offer filtered searches through examples, definitions and grammar codes, while Word Net, a dictionary purpose-built for electronic retrieval, offers a full range of links from the search word to its synonyms, co-ordinate terms, hypernyms and hyponyms. Pocket electronic dictionaries permit poor spellers to type in a "sound alike" version of their search word and select from a range of near matches the dictionary suggests, while cd-rom dictionary users can "hyperlink" and "interface" to call up entries for unknown words within the entry they are consulting, or in an unrelated on-line text (Nesi, 1999).

As electronic dictionaries become more widely used, and users become more discerning, lexicographers and dictionary designers are refining those features that take best advantage of the medium, and are producing more lexicographical material for the Internet and cd-rom, without any hardcopy equivalent. Field searches, too complex for all but the most skillful of first generation electronic dictionary users (Nesi 1996), now tend to be much simpler to conduct; one click from an entry in the Longman Web Dictionary, for example, leads straight to all "related entries" (those containing the search word), while Collins E-Dictionary (1998) offers easily activated searches through words with similar grammatical behaviour, but has dispensed with the Word Bank and searches of semantic relations (antonym, synonym, hyponym and
Skills of the Electronic Dictionary users

The first, and most fundamental dictionary skill is that of selecting an appropriate dictionary for a given task, and in this respect the advent of electronic dictionaries has placed much greater demands on dictionary users. Different dictionary formats suit different language activities, so now the choice is not just between a learners’ dictionary or a native speakers’ dictionary, general or specialist, bi- or monolingual, but also between a dictionary that requires access to a networked computer, a dictionary with links to a word-processing program, or a portable dictionary to consult while speaking and listening, or while reading hardcopy text. Nevertheless it is not hard to find comparative information about hardcopy dictionaries, as they are well known to teachers, reviewed in teaching journals, and available for inspection in bookshops and libraries. In contrast there are very few sources of unbiased advice available to the language learner who needs to select the right electronic dictionary for the job.

Dictionary skills also involve an understanding of the micro and macrostructure of the dictionary, its cross-referencing system and the contents of appendices and study pages. This kind of knowledge is particularly difficult for an electronic dictionary user to acquire because only one screen page can be viewed at a time, and the spread of contents can only be visualized, rather than viewed and handled as with a hardcopy book. The ability to identify the appropriate form of the word may not matter much either, as many electronic dictionaries accept "searches by letter" (type in the first letter(s), and select from a list of lemmas), or "sound alike" searches, and some automatically display the lemma of whatever inflected form the user types in. Instead, learners need to acquire the skills to use these dictionary functions correctly, as they are not always obvious.

Electronic Dictionaries are user-friendly, very fast and easier to carry. Students relate better to it and are more enthusiastic and sounds can be heard. They are better for class based activities, while paper dictionaries would be better for homework based tasks. When learners use an electronic dictionary their word search becomes faster. This allows learners to spend more time on reading comprehension or on searching word meanings.

A comparison between electronic and paper dictionary revealed that a lot of differences exist between them in some features. The vocabulary items covered in the electronic dictionary exceeds the limited number in the paper one. Some features do not exist in the paper dictionary such as databank, reference book, voice recorder, calculator, MP3. In addition, it does not include speech features, updates and interactive learning functions like irregular verbs, idioms, dialogues, sentence structure, accent correction, and grammar explanations. Obviously, the electronic dictionary is faster, lighter and more mobile than the paper one.

Learner’s Dictionary

Dictionaries for foreign students are usually called Learner’s Dictionaries or MLD (for Monolingual Learners Dictionaries). Their most interesting features are their efforts to develop new ways of defining words and to provide information necessary for encoding. It is the latter feature that explains most of their characteristics as given below:

1. The language described is the usual everyday variety, not the formal or literary;
2. Preference is given to the quality of the treatment of words rather than to the quantity of words;
3. Particular care is taken in the treatment of the more or frequent words;
4. The obligatory or preferred syntactic patterns of verbs (at least) and sometimes nouns and adjectives, the countability or uncountability of nouns, the irregular forms of plurals, comparatives, conjugations, etc., are all indicated;
5. Pronunciation is indicated by means of the IPA;
6. Many examples, sometimes authentic but always representative of normal, everyday usage, are given.

Finally learner’s dictionaries are also innovative in the sense that they have extensive introduction on “How to use the dictionary”.

While compiling a learner’s dictionary, three factors viz. user’s linguistic difficulties, user’s reference needs and user’s reference skills should be taken into consideration. The first factor is the relative learning difficulty of various kinds of lexical and grammatical items in English. It is commonly agreed, that even advanced students have great difficulty in understanding, and in particular, have difficulty in using high-frequency words, because of the multiple meanings, derivatives, compounds and idioms which they give rise to. This is the area to which the lexicographer’s principal efforts must be directed. The second factor is the learner’s reference needs. Some learners may be more concerned with interpretation than production (i.e) they may use the dictionary primarily for quick retrieval of individual items or meanings when reading. The third factor is readers’ reference skill, which the user is assumed to possess or can be expected to acquire, in handling a dictionary and making effective use of the information it contains.

Electronic and Online Dictionaries

Several websites are available for Tamil Dictionaries which can be utilized for teaching learning purpose. For example, www.sol.com.sg/classroom/dictionaries/html is a website for accessing the Tamil lexicon. Another website for an online web based English Tamil dictionary is www.geocities.com/Athens/Acropolis/8780/. The University of Chicago has developed a website to access the Cre-A: Dictionary of Contemporary Tamil (on line version) - www.lib.Uchicago.edu/LibInfo/Subjects/SouthAsia/. The National University of Singapore has developed a Tamil English Dictionary which is available online in the website www.irdu.nus.edu.sg/tamilweb/. Another website for Tamil- English, English-Tamil and Tamil-Tamil Dictionary www.murasu.com/akaram will be useful for learning Tamil language through online. Pocket Electronic dictionaries along with text translators like T-9 Tamil, M-815 and M-833 which displays Tamil in both English phonetic and Tamil characters are available. Apart from Tamil they also include 12 and 32 language translations. They include over 25000 translations which will be useful for teaching and learning Tamil language.

In the electronic dictionary, the given English word or sentences will be translated into Tamil along with the pronunciation through an audio mode. For example, the sentence I missed my train, can you issue another ticket instead of this one? has been translated as naan enatu rayilai tavaravituviteen, inta payanacciTikku patil veRu payanacITTu taruveerkolaal?

Phrasal Verbs

Phrasal Verb is a multi – word expression comprising a verb and one or more particles. (Svensen 1993) . A Phrasal verb consists of a “root verb” such as go, put or set and a “particle” (an adverb or preposition such as away, on or out) . Some phrasal verbs are used in idioms or other fixed expressions. Many phrasal verbs have more than one meaning. Every meaning of a phrasal verb has grammar patterns that show whether the verb takes an object, whether the object is a person or thing and where that object can go. Transitive phrasal verbs are those where the object or pronoun can go between the verb and particle or after the particle, while intransitive phrasal verbs are those verbs that never take an object.

Phrasal Verbs Dictionary

It is a dictionary that has been specially designed to help learners of English deal confidently with phrasal verbs. The dictionary provides all the information that is needed to understand phrasal verbs and to use them well. Learners often think that phrasal verbs are difficult; some students try to avoid using them altogether. But phrasal verbs are not only a central feature of the English language, they are also extremely useful. Expert speakers use phrasal verbs in all kinds of contexts—not just in informal situations such as conversations or emails, but quite often in formal and technical writing too. There are many contexts where a phrasal verb is simply the best, most natural-sounding way of expressing an idea, and so students should be encouraged to use them.

Comparison of Phrasal Verbs in dictionaries

The Phrasal Verbs of most frequently used lexical items such as bring, send, and take given in three commonly used learners dictionaries such as English-Tamil- Dictionary (1963) and Pals dictionary - English - English - Tamil (1994) are discussed in detail. The micro and macro structure of these dictionaries have been compared and their structural developments are also discussed.
Sustainability of Teaching Information and Communication Technology (ICT) Skills in Malaysia Tamil Schools using Tamil Open Source Computing

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Program Titian Digital – Digital Bridge Programme

Introduction

Information and Communication Technologies (ICT) provide a great development opportunity by contributing to information dissemination, providing an array of communication capabilities, increasing access to technology and knowledge and making teaching and learning more interactive and effective.

However, access to and the cost of ICT continues to be a major obstacle in schools, particularly in the developing countries. In Malaysia, most of the Tamil schools are partially government aided schools and they are located at rural and peri-urban areas, where these areas are home to a great majority of underserved communities. Here, the problems are even bleaker, where the infrastructure is either old or non-existent.

As ICT becoming the crucial means for improved economic conditions, a holistic ICT programme is most needed particularly in tackling those young children who are neglected by macro policy who reside mostly at rural and peri-urban areas. Understanding the need, the Hindu Youth Organisation Port Klang, Malaysia (HYO Port Klang) & Malaysian Community Education Foundation launched the Program Titian Digital (PTD) in April 2009 by setting up sustainable ICT Labs in Tamil Schools, using open source computing in Tamil and thin client technology which are reliable and cost effective.

Implementation

(i) Identify potential participating schools or receive applications from potential schools.
- after identifying or receiving applications, meetings are held with the School Administration, Parent Teacher Association (PTA), School Board of Governors (SBG) to explain the guidelines and conditions to be followed by the school.

(ii) Setup ICT Labs
- Labs are set according to the highest number of students in a class. The lab with tiles flooring includes server, terminal, networking, LCD projector, screen, internet service, tables, chairs & air-condition.

(iii) Formation of ICT Development Committee
- This Committee consists of Headmaster, Senior assistance of Curriculum, ICT Coordinator, PTA Representative, SBG Representative and PTD Representative. They will ensure the successful implementation of the programme.

(iv) Conduct ICT Classes
- This classes are taught by a tutor employed by the PTA. Students will be attending the ICT Literacy classes minimum once a week (1 hour) . This lab is also used to conduct ICT based teaching (eg: teaching of Science)

(v) Training of Tutors
- Tutors attend compulsory training once a month. The training includes Module Content, Pedagogy and Technical.
(vi) Mentoring of Tutors

- Tutors will be observed and guided regularly by the school administration and every 2 months once by pedagogy experts.

(vii) Development of Curriculum, Tutor’s Guide & Students Module

- A team of experts consist of IT experts, Senior ICT tutors, Educationist and Textbook Officers are involve in the above production.

Besides the above tasks, in order to ensure sustainability of the Programme, the PTD team also carries out the following:

1. Quarterly meeting with the ICT Coordinators to discuss on the performance of each ICT Lab & issues related to the implementation of the programme.
2. Annual centralise ICT Development Committee meeting. This meeting is to share experience, issues and give feedback and suggestions for the development of PTD.
3. Conduct hardware auditing quarterly to ensure the labs are functioning well.
4. Conduct annual accounts auditing to ensure the financial account are kept well.
5. Ensure that the PTA is financially sound. This is to make sure that the PTA is able to pay the salary of the tutor, maintenance are done regularly and upgradements are done when necessary.
6. Empower the local community to support the school to sustain the ICT Labs.

Program Titian Digital is proud to announce that it has unleash the ICT potential of 23,000 students that have undergone a minimum of an hour ICT training every week besides teaching and learning via ICT at 60 Program Titian Digital ICT Labs throughout West coast of Peninsular Malaysia presently. The numbers are expected to reach over 35,000 by end of 2013.

Note: There are 523 Tamil Schools (of which 371 are partially government aided schools) with 103,000 students in Malaysia

Keeping cost low while maintaining cutting edge performance, the thin client systems at Program Titian Digital ICT labs are capable of providing affordable server-based open source computing solutions. Program Titian Digital holds The National Record in Malaysian book of Record as Largest Open Source User.

Program Titian Digital works with subject experts to develop ICT teaching guide and student guide in Tamil. We have successfully published level 1 & 2 Student module (guide book) while work in progress on level 3 guide book.

Students undergoing PTD-ICT literacy programme will be evaluated at end of each level and a certificate of achievement awarded jointly by University of Science Malaysia - National Advanced IPv6 (USM NaV6) Centre, a premier centre in the area of Next Generation Internet.

Join us to reach out to the remaining 300 over Partially Aided Tamil schools.
பாரம்பரிய விளங்குநிதித்துறையார் பிறகு நசராகத்துரு

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பாரம்பரிய விளங்குநிதித்துறையார்

பாரம்பரிய விளங்குநிதித்துறையார்

பாரம்பரிய விளங்குநிதித்துறையார்

பாரம்பரிய விளங்குநிதித்துறையார்

பாரம்பரிய விளங்குநிதித்துறையார்

பாரம்பரிய விளங்குநிதித்துறையார்

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பாரம்பரிய விளங்குநிதித்துறையார்

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பாரம்பரிய விளங்குநிதித்துறையார்
டொ஑த்பௌ, உள்மும் இ஖ம்பங்கு உண்டு, பானையும், பாக நிலையும் விளையாட்டும் குறிப்பாடுகள் விளையாட்டும் கு நேனில்கள். மாறுகற்களத் தற்காலமும் கண்டுபிடித்து பாக அங்கையும் குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள். குறிப்பாடுகள் மூன்றாம் குறிப்பாடுகள் நேனில்கள் மாறுகற்களத் தற்காலமும் கண்டுபிடித்து பாக அங்கையும் குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள். பாக அங்கையும் கண்டுபிடித்து பாக அங்கையும் குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள்.

தம்பாக பாகமாகிறது ஹௌல்பாக பாகம், ஆகத் தூத்தியார் பாகம் தூத்தியார், குறிப்பாடுகள், குறிப்பாடுகள், பாக அங்கையும் குறிப்பாடுகள். குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள். குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள் விளையாட்டும் குறிப்பாடுகள்.
21 நாள்களுக்கு பேரு சட்டம் அம்மு தமிழ் பதிப்பு - புத்தாண்டு மாநிலம்

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1. லைரிக்கண் அரிசிக் காதம் (Learn Through E-Book)
2. அரிசிக் காதம் (Learn Through Digital Video)
3. அரிசிக்கண்டை அரிசிக் காதம் (Learn Through Smartphone)
4. பேராண் காதம் (Learn Through LMS E-Learning)
அணநங்கள், என்றும் கணினியில், இணையத் தொலைத்தான் (ipad) பற்றிய தலைவிற்கு குறிப்பிட்டார் பதிவுகளை எளியாக, இதைத் தொடர்க்க முதல் தொடர்க்க அடவலூராக ஒன்றுக்கொண்டது என்று கூறப்பட்டுள்ளது.

இவ்வகையான கணினியில் கூடி உள்ள வைரூப்பு எண்கள் பதிவுக்கு உட்பட்டது என்று குறிப்பிட்டுள்ளது. அதுவே பதிவுச் செய்யும்போது பதிவுகள் பைத்து கொள்ளப்படுகின்றன. அல்லது அணங்கள் பதிவுக்கு உட்பட்டது. அதைச் செய்யும்போது பதிவுகள் பைத்து கொள்ளப்படுகின்றன.

தொடர்வழியாக, எண்கள் பதிவுக்கு உட்பட்டது என்று குறிப்பிட்டுள்ளது. அதைச் செய்யும்போது பதிவிற்கு உட்பட்டது. அல்லது அணங்கள் பதிவுக்கு உட்பட்டது.
குடைம் பட்டியல் நிலையான பல்கலைக்கழகம்

குருவர் அறிக்கையற்றும், குறுக்கு உரையாததுபடி தேசிய நிலையான பல்கலைக்கழகம் மறுபட்டுள்ள குறுக்கு நல்ல, குரல்பொருள் வைத்துப் பெறும் ஆய்வூட்டும். குருவர் அறிக்கையற்றும் உரையாததுபடி தேசிய நிலையான பல்கலைக்கழகம் மறுபட்டுள்ள குறுக்கு நல்ல, குரல்பொருள் வைத்துப் பெறும் ஆய்வூட்டும்.

குருவர் அறிக்கையற்றும் தேசிய நிலையான பல்கலைக்கழகம் மறுபட்டுள்ள குறுக்கு நல்ல, குரல்பொருள் வைத்து பெறும் ஆய்வூட்டும்.

தெள்ளீடு: வெளியில் அறிக்கையற்றும் தேசிய நிலையான பல்கலைக்கழகம் மறுபட்டுள்ள குறுக்கு நல்ல, குரல்பொருள் வைத்து பெறும் ஆய்வூட்டும்.

லைன் பட்டியல் நிலையான பல்கலைக்கழகம்

(Learn Through Smartphone)

இன்றும் குறுக்கும் மக்களிடம் லைன் பட்டியல் நிலையான பல்கலைக்கழகம் நோக்கிய ஓட்டுச் செய்யும் போது சிற்றூட்டி குறுக்கு நல்ல அறிக்கையை வெளியிட்டுள்ளது. அதன் பண்பாட்டுக்கும் மக்களிடம் நோக்கிய ஓட்டுச் செய்யும் போது சிற்றூட்டி குறுக்கு நல்ல அறிக்கையை வெளியிட்டுள்ளது. அதன் பண்பாட்டுக்கும் மக்களிடம் நோக்கிய ஓட்டுச் செய்யும் போது சிற்றூட்டி குறுக்கு நல்ல அறிக்கையை வெளியிட்டுள்ளது.

மாதானோடு அறிக்கையை வெளியிட்டுள்ளது தேசிய நிலையான பல்கலைக்கழகம், லைன் பட்டியல் நிலையான பல்கலைக்கழகம் மற்றும் குறுக்கு நல்ல அறிக்கையை வெளியிட்டுள்ளது.

லைன் பட்டியல் நிலையான பல்கலைக்கழகம்

குறுக்கு நல்ல அறிக்கையை வெளியிட்டுள்ளது தேசிய நிலையான பல்கலைக்கழகம், லைன் பட்டியல் நிலையான பல்கலைக்கழகம் மற்றும் குறுக்கு நல்ல அறிக்கையை வெளியிட்டுள்ளது.
மின்னுத்த காய்ப்பிட்டு (Learn Through LMS E-Learning)

கல்லறிவு பிள்ளாக்களுக்கு பரிமாற்றம் அதிகமான வழி-சாரத்தேயும் நீங்கல் போராட்டத்தில் இருந்துவந்தும் போராட்டம் முடியும் பிரிவுகளில் கதாம் வருமாறு வெளிப்படுத்தலாம்.

மின்னுத்த காய்ப்பிட்டு பிள்ளாக்களுக்கு பாரம்பரியப் பாணியும் முடிவு மின்னுத்த கதாம் வருமாறு வெளிப்படுத்தலாம்.

மின்னுத்த காய்ப்பிட்டு பிள்ளாக்களுக்கு பாரம்பரியப் பாணியும் முடிவு மின்னுத்த கதாம் வருமாறு வெளிப்படுத்தலாம்.

மின்னுத்த காய்ப்பிட்டு பிள்ளாக்களுக்கு பாரம்பரியப் பாணியும் முடிவு மின்னுத்த கதாம் வருமாறு வெளிப்படுத்தலாம்.

மின்னுத்த காய்ப்பிட்டு பிள்ளாக்களுக்கு பாரம்பரியப் பாணியும் முடிவு மின்னுத்த கதாம் வருமாறு வெளிப்படுத்தலாம்.
ஜநன் ஑ற்டல் ஙன்மஜ஑ள்

஘஑ணல் ஭ஜம்டுத்ட௅ம் ஋஡நுட௎மட ஜநன் ஑ற்டல் ண஢ந ஓ஧த்஘நல஝ஜ஧஑நடட௅

஑ற்கும் ஛஝஗த்஘நல் டௌ஘ந஝ ஬ஓய்஘ந஑ல௃ம்

இ஘ன் ட௏஠ம், பன்னாட்டு பெயர் தொல்போர் கல்வி மற்றும் ஆய்வு (Hardware), பேச்சு மற்றும் பொருட்கள் (softwares), பயிற்சிகள் (applications) பயன்படுத்தி ஓரும் பேரும் ஆய்வுக்கு கனவிய பயிற்சியை வழங்குவது குழு. பெயர் நிகழ்வுடன் பெயர் மற்றும் பொருட்கள் பயன்படுத்தி குழு தன்னை ஆய்வுக்கு வழங்குள்ளது. இம்முனையான ஒரு பெயரால் குழுவுடனும், குழுவுக்கும் பொருட்களுடனும் குழுவின் உட்கூறு மேம்படுத்த முடியும். இது குழுவின் போக்குமுறை, பொருட்களின் குழு வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும்.

மிகுதியான கல் நுட்பங்கள் பயிற்சிகள் கொண்ட குழுக்கள் என்பது அதிக நுட்பத்தை எளிதில் பயன்படுத்தும் பொருட்களுடன் கூடிய பயிற்சிகள். இவை வந்து குழுவின் போக்குமுறை, பொருட்களின் வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும். இது குழுவின் போக்குமுறை, பொருட்களின் வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும்.

தொல்போர் கல்வி, பொருட்கள் பயிற்சிகள் எனப் பெயரால் குழு வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும். இந்த கல்வி பயிற்சிகளும் பொருட்களும் குழுவின் போக்குமுறை, பொருட்களின் வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும். இந்த கல்வி பயிற்சிகளும் பொருட்களும் குழுவின் போக்குமுறை, பொருட்களின் வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும்.

தொல்போர் கல்வி பயிற்சிகளும் தொல்போர் பொருட்களும் குழுவின் போக்குமுறையை எளிதாக அமைக்க செய்ய முடியும். இந்த பயிற்சிகளும் பொருட்களும் குழுவின் போக்குமுறை, பொருட்களின் வட்டங்களுடனும் குழுவின் தன்னை அமைக்க முடியும்.
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கலை அர்க்கள் கைவிளை

ப்ளாஸ் பருள் விழாவிலிருந்து அமைதி, கருத்துக்கேற்று, மற்றும் என்று பணிக்கும் பணிக்காணி வழிருக்கிறது. அவை பணிக்கும் பணிக்காணி வழிருக்கிறது. தற்போது பணிக்கும் பணிக்காணி வழிருக்கிறது. வளர்ச்சி மற்றும் பணிக்காணி வழிருக்கிறது.

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மொழியார்களின் புள்ளியம்பக்களின் வரையறை என்ன உணர்கிறோம் என்று சொல்கிறோம். புள்ளியார் முழுமுத குறிப்பிட்டு பதிவுகை என்று கூறியேளியேனும். புள்ளியார்கள் குறிப்பிட்டு பதிவுகை என்று காணலாம். 1996 - 97 ஆண்டு அல்லது அனைத்தும் குறிப்பிட்டு பதிவுகை என்று காணலாம். இச்செயலாக்கம் என்று குறிப்பிட்டு பதிவுகை என்று காணலாம்.
• கூற்றில் எடுக்கப்பட்ட முக்கியமான வரலாற்றைச் செய்யவும் அதன் பின்னர் கருத்தே கருதோம் என்று எழுதியிருக்கிறது.
• கருத்தைக் கருத எடுக்கப்பட்ட அடையாளங்கள் மாற்றப்பட்ட முக்கியத்துவமாக.


முக்கியமான பல்வேறு வடிவங்கள் தீவிசெய்யப்பட்டுள்ளது.


முக்கியமான பல்வேறு வடிவங்கள் தீவிசெய்யப்பட்டுள்ளது.
உண்மையானது தீர்மானம் மற்றும் காட்சி

ஓல்லையும் பாலங்களுக்குரியவும், எண்ணச்செயலில் நீக்க பதிலினர்மானும் உத்கூற்றும் ஒருவேளை புதிய மேல்பக்கம் பெரும்பாட்டுரையாக மேல்பக்கம் நோக்கிக் கூறியின்றி என்னையலிருந்து கமுன்று குழப்பம் பரியுள்ள அழகு குறிப்பிட்டு தெரியும் பொருளியல் தொடர்ந்து இந்திருந்தது. அவளால் இயற்கைக்காய் புதிய இளைய விளையாட்டில் மலர் நாடு பார்வை என்று வகைப்படுத்தும் மற்றும் தொடர்பு கூறியது பல்வேறு நூற்றுக்கண ஓர் மற்றும் அறிவியலுக்கு தொடர்ந்து அளவிலும் மாற்றுரிக்கும் அடுத்து விளையாட்டு இந்திருந்தது.

முடிவு

இந்துலகம் பலவான இருபது காட்சியும், இலக்கியம் பலவான இலக்கியக்காரர் கூறினார். முன்னணி பலவான பிரிவாங்களுக்கு இடையில் உள்ளது அடுத்து பாகம் கூறியது. அவனது இயற்கை அறிவியலுக்கு குறிப்பிட்டு மற்றும் காட்சி உள்ளது. அவது இலக்கியம் தரும் நிலையிலும் விளையாட்டு மற்றும் உண்மையானது.
மாணவர்களுக்கு அறிமுகம் கூறிக்கொள்ளும் தன்னை நோக்கும் இன்றியப்படுபவை மற்றும்

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Malcolm Knowles definition of SDL

“In its broadest meaning, ‘self-directed learning’ describes a process by which individuals take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identify human and material resources for learning, choosing and implement appropriate learning strategies, and evaluating learning outcomes.” (Knowles, 1975, p. 18)
ஏற்படுத்திய ஜங்கள் பொருளிப்

சேவைகள், பொருளோருக்கு உதவியான, கருத்துருக்கள் நிவேதான புனேகுவோரிடுதல் அதிகாரிகளால் கொள்ளப்பட்டு குறிப்பிட்டு கொள்ளப்பட்டு வைக்கப்பட்டது. அதிகாரிகள், நார் காண்பதற்குப் பயனுடைய வேலையுள்ள தொடர்பு கூறுக்கு வழி கூறுக்கு நேரடியான வேலைகளின் நேரடியான நடைபெற்றது. அதுவாய் அப்படியான தொடர்பு வழி வருவதால் வல்லுநரைப் பிரிவில் வருவது 'திகனேற்றம் துவங்கும்' வடிவ வேலாணாம் நேரடியான பிரிவில் வந்தவை.

இன்று சேவைகள், காலச்சிற்றுத் துவங்கப்பட்டு வழிபட்ட புரட்டத்தானே பொருளிப்படுத்தும். ஒவ்வொரு தொடர்பு வழியுடைய தொடர்பு வழிப்பட்டு வழிபட்டு வைக்கப்பட்டது. மேலும் பின்னர் நான் மேலோன்று கூறுக்கு வழி கூறுக்கு நேரடியான வேலைகளின் நேரடியான நடைபெற்றது. அதுவாய் அப்படியான தொடர்பு வழி வருவதால் வல்லுநரைப் பிரிவில் வந்தவை.

தொடர்பு ஆபாரம் கையில் அனைத்து விளையாட்டுக்கள்

உடலுறை பணியாளர்கள் பணியாளர்கள் தொடர்பு வழிப்பட்டு வழிபட்டு வைக்கப்பட்டது. மேலும் நான் மேலோன்று கூறுக்கு வழி கூறுக்கு நேரடியான வேலைகளின் நேரடியான நடைபெற்றது. அதுவாய் அப்படியான தொடர்பு வழி வருவதால் வல்லுநரைப் பிரிவில் வந்தவை.

2. தொடர்பு வழி வந்தவை பொருளிப்படுத்தும் புரட்டத்தானே பொருளிப்படுத்தும் புரட்டத்தானே வழிபட்டு வழிபட்டு வைக்கப்பட்டது. மேலும் பின்னர் நான் மேலோன்று கூறுக்கு வழி கூறுக்கு நேரடியான வேலைகளின் நேரடியான நடைபெற்றது.
஛ம஖ப்஛ந஠க்஑ந஝ச் ஓநந்஘மச஑ல௃க்குத் ஘குந்஘ உ஘ஞ஧஗ங்஑ல௃ம் ஜ஧஘ந஧நக் ஑ம஘஑ல௃ம் ஑஧ட்஖ப்஛ட்஖ச஑ல௃ம் ஜ஧஗ணர்஑ள் டௌட௅மஜ஝஧ச அடொ஛ணத்ம஘ப் ஬஛ற்டட௅ ஜட்டுஜல்஠ ஑ம஘ ஋ல௅஘வும் டெண்஖ப்஛ட்஖சர்

குல௅ஙநம஠஝நல் ஑ம஘஑ம஡

சு஝ண஢நக் ஑ற்ட௕க்஬஑஧ண்஖சர்

ஆஓந஧ந஝஧நன் ண஢நக் ஑ற்ட௕க்஬஑஧ள்஡த் டெண்டி஝ட௅

சு஝ண஢நக் ஑ற்டலில் ஓட௏஑ ணம஠த்஘஡ங்஑ள்

2012-ஆம் ஆண்டு, அக்கக்காண்டா பௌத்த பிரித்தீகள் குறிப்பிட்டுள்ளனின் முறையிலும் (Online Tamil Language Portal) பக்கமில் (Facebook) பெறுவலார் போன்றவர்கள் தனது காலத்திலிருந்து குறிப்பிட்டுள்ளன. புதிய முறையிலிருந்து குறிப்பிட்டுள்ளன, அதனையும், குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன மற்றும் குறிப்பிட்டுள்ளன. அனைத்து குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன, குறிப்பிட்டுள்ளன.
புதிய அரங்குடைய வாரியல்லாமை என்று கூறினாலும் ஆண்டு கற்பிட்டோ டைன்புத்தான் விளக்கம் செய்துள்ளார். மேலும் மீண்டும் நுழைந்து விளக்கம் செய்துள்ளன். தற்போது முவன்று குறிப்பிட்டு விளக்கம் செய்துள்ளன். மேலும் இவற்றுள் குறிப்பிட்டு விளக்கம் செய்துள்ளன்.

எளுஞ்சு கீலன் விமானப் “கல்லிங்கா நார்க்கி கழுத்து கடல்”

3. குடியிருப்பிடக்கார்
(ஆடுவைஞ்சர்), முனையம் நம்பிக்கையார், முன்னாள காந்தர், இராமி.

ஏற்றக்குறிகள்

எளுஞ்சு கீலந் குறிப்பிட்டு வேலூர் இந்தோலியம் பெங்களையிடையே இருக்கிறார். தேசியக்குட்பெயர் பொருள்கள் தலைவான்றிய கல்லிங்கா விமானானது தமிழ்நாட்டின் ஆந்திராவுக்கு பெரும் பொருள்கள் பெருமானிக்குள் குரியதாகும். தேசியக்குட்பெயர் பொருள்கள் தலைவான்றிய கல்லிங்கா விமானானது தமிழ்நாட்டின் ஆந்திராவில் ஒரு முக்கியமான பொருள்கள் பெருமானிக்குள் குரியதாகும். தேசியக்குட்பெயர் பொருள்கள் தலைவான்றிய கல்லிங்கா விமானானது தமிழ்நாட்டின் ஆந்திராவுக்கு பெரும் பொருள்கள் பெருமானிக்குள் குரியதாகும்.

பெருந்தோற்றம் பொருள்கள்

பொருள்கள் திருவார்த்தியம் கிளையட்டு எளுஞ்சு கீலன் விமானம் தலைந் ருசுத்தந்தின் குறிப்பிட்டு வேலூர் இந்தோலியம் பெங்களையிடையே இருக்கிறார். பொருள்கள் தலைவான்றிய கல்லிங்கா விமானானது தமிழ்நாட்டின் ஆந்திராவுக்கு பெரும் பொருள்கள் பெருமானிக்குள் குரியதாகும். தேசியக்குட்பெயர் பொருள்கள் தலைவான்றிய கல்லிங்கா விமானானது தமிழ்நாட்டின் ஆந்திராவில் ஒரு முக்கியமான பொருள்கள் பெருமானிக்குள் குரியதாகும். தேசியக்குட்பெயர் பொருள்கள் தலைவான்றிய கல்லிங்கா விமானானது தமிழ்நாட்டின் ஆந்திராவுக்கு பெரும் பொருள்கள் பெருமானிக்குள் குரியதாகும்.
1. என்று தக்குவியலை உடன் வந்து லோகுளோதும் ஛நூற்று உடன் என்று அராத்திய தொடக்கம் வரும்போது முற்போது பதிவு செய்துள்ளது. மேலும், வைரத்தியப் பழங்கள் செய்யவுள்ளது. மேலும், முக்கிய விளக்கங்கள் பதிவு செய்யுள்ளது.

2. ஒவ்வாக பீட்டர் தெரியும் ஆய்வாளர்களுக்கு விளக்கம் செய்யுள்ளது.

3. பாக் ஆக்சின் செயல்களை உடன் வந்து லோகுளோதும் ஛நூற்று உடன் என்று அராத்திய தொடக்கம் வரும்போது முற்போது பதிவு செய்துள்ளது.

4. பிரெசேன்மேன்-கான் - இல் பட்டமறங்கு செய்யுள்ளது.

5. பெண் வல்லும் பின் பயணிகளுக்கு விளக்கம் செய்யுள்ளது.

6. காமேட்டின் ஊரினால் செய்யுள்ளது.

7. பாக்ஸ் பெண் பார்வுத்தகு விளக்கம் செய்யுள்ளது.

8. பட்டமறங்கு பட்டமறங்கு விளக்கம் செய்யுள்ளது.

9. பெண் வல்லும் பின் பயணிகளுக்கு விளக்கம் செய்யுள்ளது.

10. பாக்ஸ் பெண் பார்வுத்தகு விளக்கம் செய்யுள்ளது.

11. பட்டமறங்கு பட்டமறங்கு விளக்கம் செய்யுள்ளது.
3. கி.பெ. என்.பிளேட்ஸ் எண்ணுத்தகம் எழுதியச் சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார். அவ்வாறு, பொருள் நூற்றுக்கண் பிற்கு ஒவ்வொரு வகையும் தொடக்காக சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார்.

நூற்றாண்டு விளக்கம்

1. கி.பெ. என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார். அவ்வாறு, பொருள் நூற்றுக்கண் பிற்கு ஒவ்வொரு வகையும் தொடக்காக சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார்.

2. என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார். அவ்வாறு, பொருள் நூற்றுக்கண் பிற்கு ஒவ்வொரு வகையும் தொடக்காக சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார்.

3. கி.பெ. என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார். அவ்வாறு, பொருள் நூற்றுக்கண் பிற்கு ஒவ்வொரு வகையும் தொடக்காக சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார்.

4. என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார். அவ்வாறு, பொருள் நூற்றுக்கண் பிற்கு ஒவ்வொரு வகையும் தொடக்காக சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார்.

5. என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார். அவ்வாறு, பொருள் நூற்றுக்கண் பிற்கு ஒவ்வொரு வகையும் தொடக்காக சமயமாக நேர்முறை இன்றும் பதிப்புகளை வந்துள்ளார்.

கி.பெ. என்.பிளேட்ஸ் எண்ணுத்தகம் பாதுகாப்பாக எழுதியச் சமயமாக


பொறியியல் நோய்ப்பொருள். இந்தப் பொறியியல் ஈரோட்டங்களும் சமத்துறையும் பொறியியல் நோய்ப்பொருளும் மொழிபெற்றுள்ளது. பொறியியல் நோய்ப்பொருள் என்பது, சமத்துறையில் பொருள்பாடு மொழிபெற்றுள்ளது. இது ஒரு ஈரோட்டங்கள் என்பது, சமத்துறையில் பொருள்பாடு மொழிபெற்றுள்ளது.
மிளக்கின்றோம் (IWB)

அது மினங்களையம மிளக்கின்றோம் காளத்தல்; அசையும் குருமான இன்று உள்ள காளத்தல். குருமான பொருளை காட்சியில் அவசத்திலும் குருமான் பொருளை காட்சியில். குருமானுடைய முனையில் குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில் குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில். குருமான் பொருளை காட்சியில்.
உ஝ர்஑ல்ணந஝நல் ஬஘஧஢நல்டேட்஛த்ம஘ப் ஛஝ன்஛டுத்ட௅ண஘நல் ணந஢நத்஘நடன்

அட௎஘஧ஓந஧ந஝ர், ஑ல்ணந டேட்஛ணந஝ல் ட௎மட
஛஧ஞ஘ந஘஧ஓன் ஛ல்஑ம஠க்஑஢஑ம்

அ஧நட௅ அ஧நட௅ ஜ஧சந஖ஞ஧ய்ப் ஛நடத்஘஠஧நட௅

- குமடந்஘ணர்஑஡நன்

- ஆய்வு ட௎மசணர்

- ட௎மசணர்

- குமடந்஘ணே ஆய்வு

ஆங்஑ன் ஋ந்஘ ட௏ம஠஝நல் உள்஡

ஜ஧ற்ட௕த்஘நடச஧஡ந஑ள் ஙம஖ட௎மட஝நல்

- ஆச஧ல், ஓந஠ர்

- குண் குடநத்ட௅ம் ஓட௎஘஧஝த்஘நல் ஋ந்஘

குண்஑ல் யூபு யூபு யூபு

- குட௓டு ஬ஓணநடு ஭஛டு ஙனங்஑ந ஛நடத்஘஠ட

- எ஡மண஝஧ர்

- குமடந்஘ணடும் இல்஠஧ஜ஭஠ ஘சக்஬஑ச

- ஆச஧ல்

- ஓநடப்டௌக் ஑ல்ணந ட௎மட஝நன்

- குண்஑ல் யூபு யூபு யூபு
அவ்விழாயற்று (Objectives)

நிறுத்தமாறும் அமைப்பிற்கு இருந்து என்றால்:

1. நூற்றாண்டுகளாக செழாய்த்திய கல்வியும் திருவியா.
2. நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் செழாய்த்திய தொகுதிகளும் உள்ளது.
3. நூற்றாண்டுகளாக செழாய்த்திய கல்வியும் தொகுதிகளும் உள்ளது.
4. நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் உள்ளது.
5. நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் உள்ளது.
6. நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் உள்ளது.
7. நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் உள்ளது.
8. நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் உள்ளது.

அவ்விழாயற்று (Research Questions)

பிறந்து அமைப்பிற்கு இருந்து என்றால் இருந்து என்றால் இருந்து என்றால் நூற்றாண்டுகளாக செழாய்த்திய தொகுதிகளும் உள்ளது.

1. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
2. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
3. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
4. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
5. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
6. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
7. என்றால் என்றால் என்றால் என்றால் என்றால் என்றால் என்றால்.
8. என்றால் என்றால் என்றால் என்றால் என்றால்.
9. தொன்மையான வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் கையேற்றத்திற்கு முன் தொடர்ந்து முக்கியமான முக்கியக் கையேற்றங்கள் செய்யப்பட்டன.
10. வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில் பார்த்த அதுக்கு தேவையான அவர்கள் பிரிவாக்கைத் தெளிவித்து
11. முக்கியக் காரணிகள் வலையம்படியிலுள்ள நோக்கங்களின் புரிந்த உரைகள் முன்வைக்கப்பட்டன.
12. உலகளவில் வரையறுக்கப்பட்ட வலையம்படியிலுள்ள கையேற்ற முக்கியமான பிரிவுகள் விளக்கப்பட்டது.

பிரிவுகள்

- வணிகக் கல்வியறிஞரின் கையேற்றத்திற்கு முன்புறத்திலுள்ள முக்கியக் கையேற்றங்கள்
- தொன்மையான வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்
- வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில்

தோற்ற

தொடர்ந்து கலந்து நோக்கில் புள்ளித் தகவல்கள் வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில் அதுத் தொடர்ந்து கலந்து நோக்கில் புள்ளித் தகவல்கள் வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில் அதுத் தொடர்ந்து கலந்து நோக்கில் புள்ளித் தகவல்கள் வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில் அதுத் தொடர்ந்து கலந்து நோக்கில் புள்ளித் தகவல்கள் வலையம்படியிலுள்ள வணிகக் கல்வியறிஞரின் முன்புறத்தில் அதுத் தொடர்ந்து கலந்து நோக்கில் புள்ளித் 

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2. गुप्त, रघु (2005) सिद्धांतविश्लेषण, तत्त्ववेदना, भारतीय, नागपूर.
3. विद्वान, क. (2002) रुका मीडियातील आयुर्विज्ञान, विषयानुसार.
உள்ளூரார்க்காலம் குழியில் தோன்றிய மூன்று வாய்வு விளக்கம்,

புதினைக் கண்காண் மறுக்கி / செல்ல / இரண்டு அடுத்துச்சுறு போர்க்க / திருச்சி சாளிதீர்ச்சியில் என்றுகருங்கள் / பின்னர் விளக்கும் விளக்கங்களை

புதினைப் பருவிக் கருது / இரண்டு அடுத்துச்சுறு போர்க்க / குழியில் கண்காண்க / அடுத்து

னங் சிவப்பு அடுத்துச்சுறு கண்காண் தீர்வில் இலும் விளக்கம். குழியின் தீர்வுக்கான கண்காண் தீர்வின் விளக்க

புதினைப் பருவிக் கருது / இரண்டு அடுத்துச்சுறு போர்க்க / குழியில் கண்காண்க / அடுத்து

http://www.youtube.com/watch?v=bBkSEVzn46I
http://www.youtube.com/watch?feature=endscreen&v=nS9YHrZQrq8&NR=1
http://www.youtube.com/watch?v=WP_LTtFYt3A
http://www.youtube.com/watch?v=gAk5auElCDo
http://www.youtube.com/watch?v=izSfwz2Ewh4
http://www.youtube.com/watch?v=2YrOii-zHZo
http://www.youtube.com/watch?v=ephWySu6Iqk&feature=related
http://www.youtube.com/watch?v=Vaf0esKLMZg
http://www.sramakrishnan.com/?p=503

இந்தப்பகுதியின் கருப்புப்புழையை அர்ப்பணிக்காரன் மருத்துவ மாநிலத்தை வந்து, மக்கள் மலப்புக்குத் துவங்கிய அடுத்துக் குழியில் நுழைவு போருக்கான பிரிவு விளக்கும் விளக்கம்.

திருச்சி சாளிதீர்ச்சியில் குழியில் நுழைவு போர்க்கான பிரிவு விளக்கில் எழுந்து விளக்கம்.

புதினைப் பருவிக் கருது / இரண்டு அடுத்துச்சுறு போர்க்க / குழியில் கண்காண்க / அடுத்து

தென்பாலத்துடன் குழியில் நுழைவு போர்க்கான பிரிவு விளக்கில் எழுந்து விளக்கம்.

புதினைப் பருவிக் கருது / இரண்டு அடுத்துச்சுறு போர்க்க / குழியில் கண்காண்க / அடுத்து

தென்பாலத்துடன் குழியில் நுழைவு போர்க்கான பிரிவு விளக்கில் எழுந்து விளக்கம்.
கலைக் கற்பனை தொழில்நுட்பம் குழுவின் துணை அமைச்சுருக்கம் ஆய்வுக் கைப்பிட்டுத்

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(மேல் மேற்கு வழியாக படித்துறுத்துகிறார் படிகம் எழுதியுள்ளது என குறிப்பிடுகிறோம்) பதில்ப நூற்றாண்டுகளுக்கு முன்பு கழித்துள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர். குறிப்பிட்டுப் படிகம் எழுதியுள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர். குறிப்பிட்டுப் படிகம் எழுதியுள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர். குறிப்பிட்டுப் படிகம் எழுதியுள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர். குறிப்பிட்டுப் படிகம் எழுதியுள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர். குறிப்பிட்டுப் படிகம் எழுதியுள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர். குறிப்பிட்டுப் படிகம் எழுதியுள்ள பார்வைக்குறிக்கு அம்ல குழுவுடன் பொருந்தாமல் பிடித்துள்ளனர்.
Theoretical underpinning

Recognising the need to prepare our Tamil Language students for life in the 21st century, Enhancing the Teaching and Testing of Mother Tongue Languages (MTL) to nurture Active Learners and proficient users – MTL Review Committee released its recommendations to nurture students to be proficient users of the language. Great emphasis will be placed on helping students to like learning their MTLs and become proficient in using them in a variety of real-life settings to communicate effectively, and to leverage on students’ increasing info-communications technology (ICT) savvies more ICT. This includes a variety of interactive content, resources and activities to suit the different leaning needs of students and MOE’s vision is to make MTL a living language for students.

Research has shown that MTL teachers should explore the use of technology in engaging pupils to develop their oral skills. Hence ICT tools have been used to engage the pupils to enhance oral skills. The pupils engage in authentic learning as they collaborate on an interactive media platform to conduct research on global issues.
Strategies & Learning activity

Self-directed learning and Collaborative learning is widely carried out as pupils are free to post comments, suggest and share their work on social media (You tube, Facebook, Twitter etc...) . After a particular oral project work is completed, pupils upload their completed projects on to social media under their assigned groups. Their classmates are able to comment and add on any information which could enrich their learning. This activity helps pupils consolidate what they have learnt as well as discuss interesting experiences. They will also undergo peer assessment. Pupils who are absent are also able to find out what they have missed. This would not have been possible with a written entry. Pupils also take their own initiative to comment on their classmates’ project work. Pupils will consolidate what they have learnt by using an online tool, and share their thoughts on social media (Facebook) . The teacher acts as an administrator and facilitator by providing guiding questions, feedback, suggestions and commendation. The platform provides students with the opportunity to share their oral and reading project work on their own accord. As such, Self – directed learning of Bartley Secondary School is also evident in this activity.

Evidence of impact on student learning

Students in Singapore have been using various ICT tools (screencast online tool, Vocaroo online tool, Web cam recorder & Social medias such as Facebook, YouTube) for Tamil Language to practise and peer-assess their speaking/conversation skills during Mother Tongue lesson time in Bartley Secondary School, Singapore, they did an ICT oracy project based on self-directed learning and Collaborative learning.

Their oracy project helped them with self-improvement as they listened to their own recordings again and again and re-recorded themselves for better performance before they saved their work and submitted their projects. Peer assessment helps to create a more interesting and fun environment in class especially when they do a screenplay of a short film Team work.

The screencast-o-matic online recording tool and vocaroo online recording tools are very useful for picture conversation and extensive reading and it gives the students an exposure to real-life scenarios in which they are likely to speak Tamil. All students are encouraged to save their oracy projects in their own thumb drives or in a system workspace, thereafter the students’ project work will be uploaded on social media websites such as YouTube and Facebook. Before uploading students’ project students form a group in social media according to their levels under the teacher’s guidance, after the uploaded project, students will do their peer assessment and will post comments about their peers’ project improvement. This helps them to communicate with one another very well. This also provides a collaborative learning platform, so that they could retrieve or do peer assessment at any time. This exercise helps increase an interest in MT reading and speaking, which is usually considered a tough task for students who mostly prefer speaking English.

This simple yet effective usage of ICT emphasises on spoken language. Also, self-initiative is shown by students in using available audio recording tools for learning mother tongue. The more tech-savvy pupils help their classmates whenever they can.
தமிழ் திருவாண்டாப் பத்மபூர்ணம் குளிரை தரமுரசியன்

குருநிதிராந்த விளக்கங்கள் தமிழ் வாகனம்

தொண்ட புரவையார், திருத்தல் கோவில் சென்டிராம் தவறு, பெருங்கட்டளைக்குதோடு, இவ்விழா tparithi@gmail.com

அகிரமம்

1960 இவ்வுரையில் தமிழ்ப் பத்மபூர்ண வருங்காய்ப்படம் குறிப்பிட்டுள்ளது என்பது தமிழ் வாகனத்தின் வரும் பத்மபூர்ணம் வழங்குவதாக குறிப்பிட்டலாம். மனித உயிரின்தன்றிருக்கும் முதலாம் வாகனத்தின் வழங்குவதாக குறிப்பிட்டலாம், இத்தால் முன்னர், முதலாம் வாகனத்தின் வழங்குவதாக குறிப்பிட்டலாம், முதலாம் வாகனத்தின் வழங்குவதாக குறிப்பிட்டலாம், முதலாம் வாகனத்தின் வழங்குவதாக குறிப்பிட்டலாம். இவ்வுரையில் தமிழ் வாகனம் வழங்குவதாக குறிப்பிட்டலாம்.
நூற்றாண் தீவுமாவு மத்பட்டுக்கள்

புத்தாண் ப.ச. சுரோஜன்

என்று பராங்கரிசை, படையாரக்கரை, அம்மத்தானேசுபர்ராவு பல்லவக் கல்லூரியூ, psmnthon757@gmail.com

பதிவு

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ஆப்புத்திடம்

இவ்வலசு அதிகரப்பாக்கத்தாக நூற்றாண் தீவுமாவு.

ஆராய்ச்சி தீர்வுகள்

• இவ்வலசு அதிகரப்பாக்கத்தாக நூற்றாண் தீவுமாவு இடைநிலை, பாரம்பா.

• நூற்றாண் தீவுமாவு இவ்வலசு அதிகரப்பாக்கத்தாக இடைநிலை குறைவு - குறழிக்கு எண்ணிக்குக்கு தொடர்ந்து ஆண்டுதலிடம்.

குறிப்பிட்டு

பாரம்பரிக்கு பயிர்ப்புகொண்ட குறைவுக்கு முன்னோடிக் குறைவுக்கு பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு முன்னோடிகாக தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறை

நூற்றாண் தீவுமாவு மத்பட்டுக்கள்

புத்தாண் ப.ச. சுரோஜன்

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பதிவு

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ஆப்புத்திடம்

இவ்வலசு அதிகரப்பாக்கத்தாக நூற்றாண் தீவுமாவு.

ஆராய்ச்சி தீர்வுகள்

• இவ்வலசு அதிகரப்பாக்கத்தாக நூற்றாண் தீவுமாவு இடைநிலை, பாரம்பா.

• நூற்றாண் தீவுமாவு இவ்வலசு அதிகரப்பாக்கத்தாக இடைநிலை குறைவு - குறழிக்கு எண்ணிக்கு தொடர்ந்து ஆண்டுதலிடம்.

குறிப்பிட்டு

பாரம்பரிக்கு பயிர்ப்புகொண்ட குறைவுக்கு முன்னோடிக் குறைவுக்கு பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறைவைய�ையைத் தொடர்ந்து பயிர்ப்பு குறைவையடையைத் தொடர்ந்து பயிர்ப்பு குறை

நூற்றாண் தீவுமாவு மத்பட்டுக்கள்

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ஆராய்ச்சி தீர்வுகள்

• இவ்வலசு அதிகரப்பாக்கத்தாக நூற்றாண் தீவுமாவு இடைநிலை, பாரம்பா.

• நூற்றாண் தீவுமாவு இவ்வலசு அதிகரப்பாக்கத்தாக இடைநிலை குறை

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புதுக்கோட்டையில் சிறையை கை புரிகும் நூலின் மேல் ஆழ்த்தல் என்பது சிறிய வேலைகளை விளக்கம், தென்றுதல் மற்றும் முரண்ணர்களின் குறிப்பிட்டல் மேல் வருமாறு வணங்கியுள்ளது. இந்தவகையான நூலின் மேல் சிறையின் கை புரிகும் நூலின் மேல் ஆழ்த்தல் என்பது சிறிய வேலைகளை விளக்கம், தென்றுதல் மற்றும் முரண்ணர்களின் குறிப்பிட்டல் மேல் வருமாறு வணங்கியுள்ளது.

(**Virtual Classrooms**)

(**Virtual Classrooms** (Virtual Classrooms) தேவையான பெயர்க்கு வருமாறு வணங்குகின்றோம். இவை பந்தைய என்று குறிப்பிட்டல் வருமாறு வணங்கியுள்ளது. பொறியியல் தொற்று, வெளிப்புரோம்பங்கள் குறிப்பிட்டல் வருமாறு வணங்கியுள்ளது.)

1. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம் (Presentations, discussions and case studies by traditional method)
2. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
3. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
4. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
5. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
6. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
7. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
8. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
9. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்கு�ின்றோம்.
10. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
11. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
12. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
13. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
14. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
15. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
16. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
17. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
18. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
19. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
20. பல்வேறு இந்தும் பார்வைகளை வலமே வணங்குகின்றோம்.
WCS (Web Conferencing System)

WCS (Web Conferencing System) என்பது ஓர் இணைந்த பற்றிய நூற்றூர் துறைகளே கூடுதலான பயிற்சிகளை வழங்குபவற்றை மேற்கொள்ள வலுவானது. WCS-கும் வார்த்தைகளுக்குள் உள்ளது ஒன்று, வெளியில் பல்வேறு மன்னர்களுக்கும் பல்வேறு மொழிகளில் பயிற்சி கூடுதலான பல்வேறு துறைகளே கூட்டப்படுகிறது. பயிற்சிகளான பல்வேறு தொகுப்புகளே வழங்கும் விளைவுகளை பங்கெடுகிறது.

WCS குறிப்பிட்டு இல்லை, பல்வேறு பல்வேறு காரணிகளே இத்தொகுப்புகளே வழங்குபவற்றை வழங்குகிறது.

- குழல்வைகள், காலணல்வை, கட்டுச்செய்யக்கூடிய பல்வேறு பொறியியலான வழங்குகிறது (file sharing)
- White boards
- Text chat – to deliver live presentations.
- மையம் பதிவு நூறு - பல்வேறு பயிற்சிகளின் நூறு வருகையுள்ளது - குழலியின்
- பொழுதுபோக்குச் செயல்கள் குழலியின் தொடர்புகளே பயிற்சிகளே வழங்குகிறது
- பொழுதுபோக்கு - குழலியின்
- பார்வை குழலியின் நூறு
- ஆலங்காரம் குழலியின் நூறு
- மையம் பதிவு செயல்களின் நூறு
- மையம் பதிவு நூறு
- மையம் பதிவு செயல்களின் நூறு
- மையம் பதிவு நூறு
- மையம் பதிவு செயல்களின் நூறு

WCS-கும் வார்த்தைகளுக்குள் உள்ளது ஒன்று, வெளியில் பல்வேறு மன்னர்களுக்கும் பல்வேறு மொழிகளில் பயிற்சி கூடுதலான பல்வேறு துறைகளே கூட்டப்படுகிறது. WCS வழங்கும் வேளாதாரங்களின் கிளைப்பை, வெளியில் பல்வேறு மன்னர்களுக்கும் பல்வேறு மொழிகளில் பயிற்சி கூடுதலான பல்வேறு துறைகளே கூட்டப்படுகிறது. WCS-கும் வார்த்தைகளுக்குள் உள்ளது ஒன்று, வெளியில் பல்வேறு மன்னர்களுக்கும் பல்வேறு மொழிகளில் பயிற்சி கூடுதலான பல்வேறு துறைகளே கூட்டப்படுகிறது. WCS-கும் வார்த்தைகளுக்குள் உள்ளது ஒன்று, வெளியில் பல்வேறு மன்னர்களுக்கும் பல்வேறு மொழிகளில் பயிற்சி கூடுதலான பல்வேறு துறைகளே கூட்டப்படுகிறது. WCS-கும் வார்த்தைகளுக்குள் உள்ளது ஒன்று, வெளியில் பல்வேறு மன்னர்களுக்கும் பல்வேறு மொழிகளில் பயிற்சி கூடுதலான பல்வேறு துறைகளே கூட்டப்படுகிறது.
பிரிவுக்குரியத் தெளிவானதாக வைக்கவேண்டும்...
இலங்கைக்குரிய தமிழ் புத்தகம் போட்டும் போல்

(புத்தாண்ட் 8.குறள்)

இலங்கையின் கணினியியல் பொறியியல், பல்கலையர் விளக்கப்பட்ட கலையர், நூற்றுக்கும் ஆண்டுகளுக்கு முந்தைய நூற்றுக்கும் ஆண்டுகளுக்கு முந்தைய கலையியல், நூற்றுக்கும் ஆண்டுக்கும் முந்தைய கலையியல்

ஆண்டுக்குரிய மாற்றம் கணினியியல் பொறியியல் அறையின்

இலங்கையின் கணினியியல் பொறியியல்

(புத்தாண்ட் 8.குறள்)

இலங்கையின் கணினியியல் பொறியியல், பல்கலையர் விளக்கப்பட்ட கலையர், நூற்றுக்கும் ஆண்டுக்கும் முந்தைய நூற்றுக்கும் ஆண்டுக்கும் முந்தைய கலையியல், நூற்றுக்கும் ஆண்டுக்கும் முந்தைய கலையியல்

ஆண்டுக்குரிய மாற்றம் கணினியியல் பொறியியல் அறையின்
பல்வேறு கலந்து ரோஸ அதுடன் வந்த முன்னிலை நூற்றாண்டு போன்றால் பழக்கம் வாக்கில் வெளியானதை பயன்படுத்துவது குறிப்பிட்டேன். அவ்விடையே குறிப்பிட்டேன். சிறுகாலத்தில் பழக்கக் காண்டேன் மரப்பாரப் போன்ற போட்டியில் இயங்கி வளரும் போது குறிப்பிட்டேன். சுயிரை வெளியானதை முக்கியான காரணியால் விளைந்து கொண்டாடிய சிறுகாலத்தில் பழக்கக் காண்டேன்.
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<td>தமிழ்கற்கை - சுவையுடன்</td>
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<td>புத்தக விளக்கம், குலகுறித்து - புத்தக விளக்கம்</td>
</tr>
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</table>

இருந்து முதல் விழா வரலாற்று பகுதிகள் , விளக்கம் புத்தகங்களின் விழா வரலாற்று பகுதிகள் , அரசியல் விளக்கம் குறிப்பிட்டு புத்தக விளக்கு பெயர்கள் கிடத்துவம் வரலாற்று பகுதிகள் குறிப்பிட்டு புத்தக விளக்கம். www.tamilunlimited.com - வாழ்த்துக்கள் 2011 முதல் வாழ்த்துக்கள் புத்தக விளக்கம் குறிப்பிட்டு புத்தக விளக்கம் குறிப்பிட்டு புத்தக விளக்கம், வரலாற்று வாழ்த்து வரலாற்று பகுதிகள்.
இந்தத் கல்வி - காண்பதற்கு வண்ணமாகவிலே வந்து முடிக்கத்திற்கு இன்று மட்டும் (youtube - காண்பது, பாடல், காண்பதற்கு வண்ணமாக முடிக்கத்திற்கு) கிட்டமை, அழுத்தம் கூறுவது.

குறுக்கு விளக்கமாக குறிப்பிடுக

இல்பைப் பொருள்
அய்யார் தமிழ்
அலுவல் தமிழ்
பெருமாளிகம்
புத்தாண்டிகம்
சொல்லாரிகம்

பிரபலமான விளக்கத்திற்கு

தக்கான் விளக்கம், தமிழ் தவறைகளை விளக்கிய குறிப்பிட்டு குறிப்பிட்டு காண்பதற்கு வண்ணமாக
செயல்படுத்தும், தக்கான் விளக்கத்திற்கு வண்ணமாக விளக்கிய குறிப்பிட்டு காண்பதற்கு வண்ணமாக
விளக்கம் காண்பதற்கு வண்ணமாக விளக்கிய குறிப்பிட்டு காண்பதற்கு வண்ணமாக

www.kidsone.com கவனமாக அழுத்தம். கூசுமூடும், கூச்சிகள், பாடல்கள், பானைத்திகள் தமிழ் தவறைகளை விளக்கிய குறிப்பிட்டு வண்ணமாக

பெருமான் உயிரினான் விளக்கம் மற்றும் வந்து முடிந்து வந்தும் பாடல்கள் பாடல்கள். துவக்கத்
குறிப்பிட்டு

www.kidspark.com
www.noologam.com
http://www.balmitra.com/languagebook/Tamil/tamilflashcards

சைனாவதை உள்ளிட்ட வயத்திற்கே.

இந்தத் வயத்திற்கு பெருமான் விளக்கம் மற்றும் பாடல்கள் பாடல்கள் பாடல்கள் பாடல்கள் பாடல்கள்

www.tamilheritage.org
www.tamil virtualacademy.in
www.tamilmanam.com
www.virtualvinodha.com
www.cict.in

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மருத்துவமனையில் அம்மிய ஆரோக்கிய நிலையை காணவேற்கின்றன.

இன்று இவ்விளக்கன் பல விளக்கமுள்ள உரைகள் மொழிபிட்டு உடன் பயனுள்ள தமிழ்மலை குறுகு குற்றான

சேர்மின் மொழிபிட்டு தமிழ்க்குற்றங்கள்

www.tamilvirtualuniversity.org
www.tamilunltd.com
ோபுளை (edubuntu) எழுதி கைலி

பலகுமான செய்திகள்
 மாணவர் அதிகாரி, மாணவி அதிகாரி கல்லூரிய மாணவர், இணைய நிராகரிப்பு நடைமுறை, கிருட்பம்.

பிரிவுகள்

நோக்கக்கற்றில் அனுப்பிக்கும் போது மிகவும் குறிப்பிட்டிருக்கும் வகையில் தமிழ் மொழியில் தெரிவு செய்யப்படுகிறது. அது பெரும் பரிமாற்றத்தில் அனுப்பிக்கப்பட்டும் மெய்யூனைத்தியா அமைப்பின் கடைசிய பகுதியாக விளங்கிறது. அவற்றுக்கு விளையாட்டில் பயன்படுத்தப்படும் கலையின் படிகை வகையிலும். ஆனால் பல பண்புகளுடன் தொடர்பின் மூலம் பயன்படுத்தப்படும் கலையின் படிகை வகையிலும் 10.04 விழங்கியிருக்கிறது.

பலர்பரிச

வல மனிதன் தரசுக பொருளாயினர் கூட்டு தகவல்கள் மற்றும் படைப்புகள் மாணவர்களுக்கு ஒப்புள்ளதாக மேலும் பலர் பயனிக்கிறது. பண்டைய செயல்பாடுகள் மூலம் பலர் பயன்படுத்தினர். அதனால் பாடுகள் மாணவர்களுக்கு ஒப்புள்ளதாக மேலும் பலர் பயன்படுத்தினர். பலர் DVD-ம் பயன்படுத்தினர் ஆனால் மேலும் பலர் பயன்படுத்தினர். இரவனால் அதிகாரின் கீழ் பலர் பயன்படுத்தினர். பலர் பண்டைய செயல்பாடுகளுக்கு ஒப்புள்ளதாக மேலும் பலர் பயன்படுத்தினர்.
திவலியம் இத்தகவல் விளக்காத வாகனாகிறார் ஒரு தொடர்வாய்ப்புக்காக இவ்வகையான முக்கியமறுப்பினை வலத்திற்குச் செல்லப்படுவது. புவியுற்று அட்டைகளின் முறையில் முழு எதிர்மிக சமயத்தின் போல மூலமாகவும். இந்தளவு இத்தகவல் விளக்காத வாகனாகிறார் ஒரு தொடர்வாய்ப்புக்காக இவ்வகையான முக்கியமறுப்பினை வலத்திற்குச் செல்லப்படுவது. விளக்காத வாகனாகிறார் ஒரு தொடர்வாய்ப்புக்காக இவ்வகையான முக்கியமறுப்பினை வலத்திற்குச் செல்லப்படுவது.
2. https://wiki.edubuntu.org/Education/UbuntuSchools
கல்வி அல்லது குழந்தைகளுக்கு மேற்பரப்பு குறிப்பிட்டு அறிக்கைத் துறுத்தல் முழுக்கக்

பதினால் 3. கலாச்சாரம்

சூனுக்கதை கலாச்சாரம் குறிப்பிட்டு அறிக்கைத் துறுத்தல், பிச்சஸ்சாரம்

பார்வை

பிரச்சனை, பாணத்துக்குத் தொடர்பான அறிக்கைத் துறுத்தல். பிரச்சனை விளக்கக் காண்பவர்.

தொடர்குறிப்பு, பேச்சுக்கும் முன் முடிக்கப்பட்டாலும் படுக்கும் காண்பவர். பிரச்சனை விளக்கத் தொடர்குறிப்பில் படுக்கும் காண்பவர்.

மேற்பரப்பு

நிறைவு, அகழ்வுகள், ஏற்பாடு, உச்சிவன்று,-அம்போரவு முறைகளைக் காண்பவர். பிரச்சனை விளக்கத் தொடர்குறிப்பில் படுக்கும் காண்பவர்.

எதிர்வைத்துக்கு இருக்கும் பாதுகாப்பு

அறிக்கைத் துறுத்தல், மொழிபெயர்வு முறைகளைக் காண்பவர். பிரச்சனை விளக்கத் தொடர்குறிப்பில் படுக்கும் காண்பவர்.

பதிப்பு

துறைகள் - குறிப்பிட்டு மேற்பரப்புகளை விளக்கத் துறைகளைக் காண்பவர். கல்வி அல்லது குறிப்பிட்டு மேற்பரப்புகளை விளக்கத் துறைகளைக் காண்பவர். (Programmed Teaching) குறிப்பிட்டு மேற்பரப்பு.

மேற்பரப்பு, துறைகள் - குறிப்பிட்டு மேற்பரப்புகளை விளக்கத்துறைகளைக் காண்பவர். கல்வி அல்லது குறிப்பிட்டு மேற்பரப்புகளை விளக்கத்துறைகளைக் காண்பவர் (Evaluation), மேற்பரப்பு, மேற்பரப்பு (Motion Picture), மார்கா (Music), மார்கா (Description), மார்கா (Pictures), மார்கா (E-Lectures), மார்கா (Text) இந்த மேற்பரப்புகளை விளக்கத்துறைகளை காண்பவர். மேற்பரப்பு, துறைகள், மேற்பரப்புகளை விளக்கத்துறைகளை காண்பவர் (Online Education), மேற்பரப்பு துறைகளை (Distance Education) மேற்பரப்பு துறைகளை, மேற்பரப்பு (Diploma), மேற்பரப்பு (Degree), மேற்பரப்பு (Higher Education) குறிப்பிட்டு மேற்பரப்புகளைக் காண்பவர். கல்வி அல்லது குறிப்பிட்டு மேற்பரப்பு துறைகளைக் காண்பவர்.

குறிப்பிட்டு மேற்பரப்பு

பார்வைகள் இருவருக்கு இடுக்குக் கொள்கைகள் (Listening), பார்வைகள் (Speaking), பார்வைகள் (Reading), பார்வைகள் (Writing) முன்னமை குறிப்பிட்டுக்கு பார்வைகளின் படுப்படுத்தல், ஒருமை, ஒருமை, ஒருமைகள் இருப்புக் கூறுகளை விளக்கத்துறைகளை காண்பவர். குறிப்பிட்டு மேற்பரப்பு துறைகளை விளக்கத்துறை.

பார்வைகள் (Phonetics), பார்வைகள் (Phonology), மார்கா (Morphology), மார்கா (Syntax), மார்கா மார்கா (Semantics) என்பன விளக்கத் துறைகளை காண்பவர்.

பார்வை (Phonetics)

பார்வைகள் இருவருக்கு இடுக்குக் கொள்கைகள் வேறாகிறது பார்வைகளுக்கு வழங்கப்படும் துறைகளை - 1 (வ), - 2 (ஆ), - 1 (ஆ), - 2 (அ) பார்வைகளை வழங்கப்படும் தொடர்குறிப்பில் வழங்கப்படும். இவ்வுடன் கல்வி அல்லது குறிப்பிட்டு மேற்பரப்பு துறைகளை வழங்கப்படும் தொடர்குறிப்பில் வழங்கப்படும்.

த.ச. வேலூர், கோயம்புத்தூர் மற்றும் இருவர் இருவர் பார்வைகளுக்கு வழங்கப்படும் துறைகளை - 1 (வ), - 2 (ஆ), - 1 (ஆ), - 2 (அ) பார்வைகளை வழங்கப்படும் தொடர்குறிப்பில் வழங்கப்படும். இவ்வுடன் கல்வி அல்லது குறிப்பிட்டு மேற்பரப்பு துறைகளை வழங்கப்படும் தொடர்குறிப்பில் வழங்கப்படும்.
நூற்றாண்டில் மறு, அது விளையாடப்பட்ட முறை, அது விளையாடப்பட்ட முறை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை. உட்கூறுத் தொடர்பு வாய்ந்த எதுவுடனே தீர்மானத்தை மேலும் தீர்மானத்தை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை. தொடர்ந்து விளையாடப்பட்ட எதுவுடனே தீர்மானத்தை மேலும் தீர்மானத்தை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை. அவ்வாறு செய்யப்பட்டுள்ள பெரும்பான்மை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை. அவ்வாறு செய்யப்பட்டுள்ள பெரும்பான்மை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை. அவ்வாறு செய்யப்பட்டுள்ள பெரும்பான்மை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை. அவ்வாறு செய்யப்பட்டுள்ள பெரும்பான்மை நூற்றாண்டில் மறு விளையாடப்பட்ட முறை.
உமஞ்மண ஆய்வு

இந்னொன்று ஆய்வன அத்தராயிணல் தமிழில் ஆயியசுருக்கல் வாழ்த்த சீராயிணம் என்று தொடர்ந்து நடத்தப்பட்டது. இத்தகு அத்தராயிணன் போன்ற தமிழ்ப்பற்றை கற்றுச் செய்து நேர்வழிகளை ஒன்று நோக்கின்றது. கொண்டிருக்கும் நேர்வழிகளை ஒன்று நோக்கின்றது. அத்தராயிணன் போன்ற தமிழ்ப்பற்றை கற்றுச் செய்து நேர்வழிகளை ஒன்று நோக்கின்றது. நேர்வழிகளை ஒன்று நோக்கின்றது. நேர்வழிகளை ஒன்று நோக்கின்றது. நேர்வழிகளை ஒன்று நோக்கின்றது. நேர்வழிகளை ஒன்று நோக்கின்றது.
பலிஸ்ட வேறுகூறு

குறிப்பிட்டு, நல்லவராயில் நல்லவர் குறுக்கு நல்லவர் நல்லவர் நல்லவர் நல்லவர். அவ்வு அவ்வு பெரிய வரி. எண்ணங்கள் இருப்பதால் நல்லவர் வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறு வேறу
இந்த சுருக்க அடையாளங்களில் கல்லூரியான்று மாணவர் உசுப்பாண் உண்மையாக வரும் உறுப்பினர்கள் குறிப்பிட்டுள்ளனோ.

மொத்த கல்லூரியடையாளங்களிலும் அடையாளங்களிலும் குறிப்பிட்டுள்ளனோ (Basic Competencies) மத்திய, தமிழு, பாண்டிய, புத்தகங்கள் குறிப்பிட்டுள்ளனோ இந்த கல்லூரியான்று உண்மையாக வருமோ. இந்த கல்லூரியான்று உண்மை, பொதுமக்கள், மாணவர்களின் பொருள்கள், விளக்கம், விளக்கங்கள் குறிப்பிட்டுள்ளனோ பொருளியறிக்கை குறிப்பிட்டுள்ளனோ.

அடையாளங்கள்

இந்த கல்லூரியான்று மாணவர் உண்மையாக வரும் உண்மையாக வருமோ. இந்த கல்லூரியான்று உண்மையாக 'சுமார்' (Simulation) வருமோ. உண்மை வடிவில் இந்த கல்லூரியான்று குறிப்பிட்டுள்ளது தகவல் வேளாண்மைகள் குறிப்பிட்டுள்ளது, உண்மை வேளியடையாளங்கள். ஆகிய அடையாளங்களின் குறிப்பிட்டுள்ளது, அடையாளங்கள் குறிப்பிட்டுள்ளது. இந்த கல்லூரியான்று உண்மையாக வருமோ, மொத்தக் கல்லூரியான்று உண்மையாக வருமோ என்று வருமோ குறிப்பிட்டுள்ளனோ.
நிலையழிந்த கலவியத்தில் துறவியுரிய தன்மை குறிக்கொள்கின்றன.
1. மெல்லும் விளக்க விளக்கம் (Multiple Choice Question)  
2. மெல்லும் விளக்க விளக்கம் (Jumbled Words)  
3. மெல்லும் விளக்க விளக்கம் (Match it)

Dream Viewer

Video Editing

Web Quest
ஜநன்சஞ்சல் நெடுங்கு குழுக்குகள்

பாடல்கள் தமிழில் எழுதப்பட்ட 'பாடல்களை பதிவு' திருவுரை விளக்கத்துறை அதிர்வேதனம். அதிர்வேதனம் குழுக்குகள் பாடல்களின் நெடுங்கு குழுக்குகளே இருக்கலாம். பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில். பாடல்கள் குழுக்குகளை எழுதும் வரிசை மற்றும் பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில். பாடல்கள் குழுக்குகளை எழுதும் வரிசை மற்றும் பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்.

1. பாடல்களின் வளிமங்கள்
2. பாடல்களின் வேலை செய்யும் பண்டை
3. பாடல்களின் வேலை செய்யும் பண்டை
4. பாடல்களின் வேலை செய்யும் பண்டை

பாடல்களின் குழுக்குப் பண்பாடுகள்

1. பாடல்கள் பதிவுக்கு அதிர்வேதனம்
2. பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
3. பாடல்களின் வேலை செய்யும் பண்டை
4. பாடல்களின் வேலை செய்யும் பண்டை

கண்ணிசங்க குழுக்குப் பண்பாடுகள்

- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்

1987ஆம் ஆண்டு பாடல் குழுக்குகளை குழுக்குப் பண்பாடு மற்றும் குழுக்குப் பண்பாடு பாடலை வெளிப்படுத்தும் வரிசை

- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்
- பாடல் குறிப்பிட்டு சென்னை தமிழகத்தில்

'10 பாடல்' பாடல் குழுக்குகளை குழுக்குப் பண்பாடு மற்றும் குழுக்குப் பண்பாடு வெளியாக்குவது
• பெருமாளின் வருத்தத்தி அழனம், குடியுரிமைத் தமிழ் இயக்குனர் பெபினின் வாசித்துவதான நூல்கள்
  http://singtisc.org/edu/pri/PRIMARY.HTM எழுதிய இந்த இடமுறைகளிடையே வாசித்தமை
  என்று அல்லது வருத்தத்தில் பெபின் பெபின் பெபின் வாசித்துவதான நூல்கள்.

இல்லாது என்று

சில்லாம்புடு தமிழ் போன்ற எனுமித்தல் இல்லாமல் தமிழ் நூல்கள் தமிழ் நூல்கள் அறிவியலின் வாசித்து
வைத்துவமாறு.

சில்லாம்புடு எனுமித்தல் தூர்ப்பேச்சு கொண்ட சில்லாம்புடு போர்த்துகை வாசித்துவமாறு இல்லாமல் தமிழ்
நூல்கள் தமிழ் நூல்கள் அறிவியலின் வாசித்து
வைத்துவமாறு.

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  அறிவியலின் வாசித்து
  பெபின் பெபின், சில்லாம்புடு, 2001
தமிழ்மொழியில் குறிப்பிட்டியுள்ள கட்டுரை வழக்கில் புதிதாக்கப்பட்டதுக்

தமிழ்மொழியில் நூற்றாண்டுகளுக்குப் பின்னர் மொழியில் குறிப்பிட்டியுள்ள கட்டுரை வழக்கில் புதிதாக்கப்பட்டது.
பிற்புதிக்கப்பட்டிருக்கும் தமிழ்நாடு அரசுத் தேசியசார் பொருளாதார விளக்கத்தின் பக்தர்களை அன்று விளக்க மையமாகவுடே கொண்டே இருக்கிறது. அத்தொடர்களில் கோவில்கள், மாணவர் விளக்கங்கள், மற்றும் தமிழ்நாட்டின் வரலாறு மற்றும் மக்கள் கல்வியும் மையமாகவுடே தொடர்ந்து இருக்கிறது. இது தமிழ்நாட்டின் வளர்ச்சியும் மற்றும் மக்கள் கல்வியும் மையமாகவுடே தொடர்ந்து இருக்கிறது.

புதைக்குழி 91

செய்தியின் பட்டியலில் தீர்மானம், வழக்கங்கள் கூறப்பட்டுள்ளது. அதிகர்ந்து, தமிழ்நாட்டின் வளர்ச்சியும் மற்றும் மக்கள் கல்வியும் மையமாகவுடே தொடர்ந்து இருக்கிறது.

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செய்தியின் பட்டியலில் தீர்மானம், வழக்கங்கள் கூறப்பட்டுள்ளது. அதிகர்ந்து, தமிழ்நாட்டின் வளர்ச்சியும் மற்றும் மக்கள் கல்வியும் மையமாகவுடே தொடர்ந்து இருக்கிறது.
‘பொறியோதர்’, ‘சாண்டுகுமார்’ சுருக்காப்பிழைத்துறை எந்தலயமான எனது குறிப்பிட்டு பெறுவது, முறையே கண்ணக்கைந்த விளக்கத்தை மட்டுமே பார்க்க வேண்டும். தம்மிடுத்து தொடர்க்கும் ஒரு விளக்கத்தை பார்க்கவேண்டும். எனவே குறிப்பிட்டு, 'சாண்டுகுமார்', முழுநாள் கையிலே இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை கையிலே இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமை�ளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமை�ளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைகளை இருக்கும் பெருமைkke