

Cloud Based Mobile Business Card Reader in Tamil

Tamizhselvi. S.P, Vijayalakshmi Muthuswamy, S. Abirami

Department of Information Science and Technology, CEG Campue, Anna University

tamizh8306@gmail.com, vijim@annauniv.edu, abirami_mr@yahoo.com

Abstract

In the modern era, the advancement of technology used in mobile phones has greatly reduced the existence of traditional business cards. Rather than having the hard copy of the business card, saving the same information either as a contact or an image within the handheld mobile is a better choice in today's world. This technique of capturing an image (using the inbuilt camera) and recognizing the textual information using Optical Character Recognition is available in different language but it has not been implemented for Tamil language. The proposed system is to design a Business card reader for Tamil language in smart phones using cloud environment.

The necessity of processing in cloud is to mainly reduce the load within the mobile and limit the resource constraints required for processing. Tamil Optical Character Recognition in cloud retrieves and recognizes the Tamil textual information from the scanned image. This process includes different phases such as preprocessing, segmentation, feature extraction, classification, Unicode mapping etc to rebuild the textual information from image. The recognized Tamil text is given in turn to the mobile device. The proposed method reduces the overhead of handheld mobile devices and enhances the Tamil language Optical Character Recognition.

Keywords: *Mobile Cloud, Tamil OCR, Smart phones*

1. INTRODUCTION

Mobile computing allows transmission of data, voice and video through any wireless medium. It aids (speeds) large number of application on a single device. It provides access information through Smart phones, Tablet, i-Phone and many other devices. Among this, Smart phone leads to wide use in recent trends and prosperity of mobile computation. Dream of "Information at your fingertips anywhere, anytime" has become true [1]. Yet, Mobile computing are still resource constraint-limitation of battery (power consumption), computation, interference, the Quality of Service (QoS), bandwidth connection latency, variation in signal power, data storage. Among these issues, computation becomes the major issue in smart phone through mobile computing.

To overcome the limitation of mobile computing, the integration of mobile computing with Cloud Computing brings many opportunities. Cloud Computing has evolved business models for users that provide Internet services with technologies to provide and manage abundant resources of computation and data storage over the network at relatively low amortized operation costs [2]. In Cloud Computing, the user information is stored in cloud server which can be accessed by the user through internet. Cloud computing provides several services such as shared resources, software and information. Multiple users can simultaneously access a cloud server to retrieve and update their data. The mobility and reliability of user information has been achieved through integration of cloud and mobile computing. The characteristics of Cloud-based service has on-demand, broad network availability, resource pooling, rapid elasticity and reliable.

By converging cloud computing advantages with mobile computing, the new technology (Mobile Cloud Computing) has been evolved. This mobile cloud computing intends at manipulating cloud network techniques for storage and processing data on smart phones on any other equivalent device. As a result, the combination of mobile cloud computing with cloud computing reduces the limitations of smart phones and other perceptive devices can obtain service in a wireless environment. Thriving of mobile cloud computing without any fidgets depends on the quality of communication channels and granting the quality of service (QoS).To provide better compatibility, mobile cloud computing started to manifest its effects with many innovative smart phone application. It connects with all social network-business, commerce, transportation and hospitals etc, to enhance smart phone users.

The embedded business card reader is very helpful to those users who need to input contact information contained in the business card into the mobile device. At present, the existing mobile OCR devices usually use pen-style scanners to sense text images, such as C-Pen and WizCom's

QuickLink Pen. These devices need complicated scanners, and are not convenient for user to operate. OCR based on images captured by digital cameras attracts attentions for years due to the challenges resulted from low resolution, blur, and perspective distortions of the image captured by camera. The CamWorks[1] supported by Xerox research center has made great efforts in this field. Their dedicated image processing technologies have achieved good results under desktop computing platforms.

Business card readers (BCR) are useful as practical application for the common man. Initially Digital Card Readers are having standalone devices which have all the image recognition software and special hardware for OCR technology. With the advent of smart phones and Cloud Computing, the technology has been changed. Most smart phones are equipped with powerful cameras that are able to take clear and accurate images of textual content. Cloud computing has also enabled us to shift the resource intensive tasks such as running an OCR program to remote machines which in turn decreases the burden on the smart phone and also increases speed. Though there are BCR applications available from the Google Play Store for the user with several languages, but it does not provides support for the Tamil Language.

2. RELATED WORK

According to the general image processing methods, the camera-captured color image will be converted to gray-scale image. Then, the gray scale image will be binarized and de-skewed. Finally, the de-skewed binary image will be used to detect text lines, words, and characters. The problem of such methods is that they have high memory requirement and low computation speed, which makes them not suitable for implementation in mobile device. Multi-resolution analysis of images is a widely used method in image processing [5]

The process of recognition of handwritten or printed document is generally known as Optical character recognition, simply OCR. Scanning of the text which converts the paper document into an image is the starting stage. This image is processed in many stages and finally converted in to a character codes such as ASCII so that a system can edit and manipulate this character. As mentioned, the OCR method consists of a number of steps. They are Binarization, Noise removal, Thinning, Skew Detection & Correction, Line, Word and Character Segmentation, Feature Extraction and Selection and classification. Preprocessing steps are required for any kind of OCR system before the actual recognition. This is needed because of the existence of a lot of noise with the scanned image. The different steps and type of preprocessing algorithms depend on Tamil is the official language of the South Indian State 'Tamil Nadu' and the union territories of Pondicherry and the Andaman and Nicobar Islands. Tamil is also one of the official languages of Srilanka and Singapore. The history of Tamil language is divided into three periods; Old Tamil, Middle Tamil and Modern Tamil. The Tamil script consists of 12 vowels, 18 consonants and one special character, the aytam. The vowels and consonants combine to form 216 compound characters, giving a total of 247 characters. All consonants have an inherent vowel as with other Indic scripts. This inherency is removed by adding an over dot called a pulli, to the consonantal sign, whereas no such distinction is there in 36. Even Handwritten Recognition Systems are widely available for this language. Siromony, R Chandrasekaran and M Chandrasekaran [6] proposed a system for recognition of printed Tamil characters using encoded character string dictionary.

Unicode is a worldwide accepted encoding standard for different languages and text where every character is assigned a unique numerical value as its representation. The Tamil Unicode range is from U+0B80 to U+0BFF. These Unicode characters are of 2 bytes size each. Optical Character Recognition (OCR) is the process of translation of images of typewritten or handwritten text into machine editable text. A number of techniques of Pattern Recognition such as Template matching, Neural Networks, Syntactical Analysis, Hidden Markov Models, Bayesian Theory, etc have been explored to develop robust OCRs for different languages. At present we have efficient and inexpensive OCR packages which are commercially available for the recognition of printed documents. Among those we have enough facilities for languages such as English, Chinese etc. Even handwritten document recognition facilities are widely available for these languages. When considering the Indian languages many attempts are made to develop the OCR system for Devanagari, Oriya, Tamil [2], Telugu [3], and Kannada [4] etc. But this area needs further more developments and the researches are going in this field.

3. PROPOSED WORK

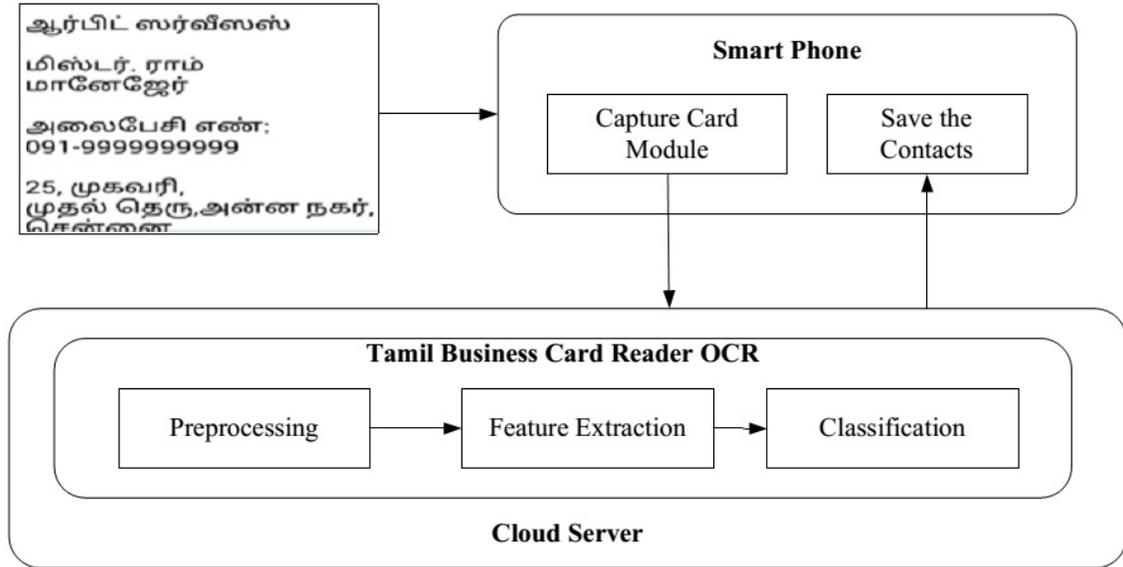


Fig 1. Client Server Architecture for business card reader

Fig 1 shows the Client Server Architecture for business card reader. The client server architecture describes the two way communication between the mobile users and the cloud service providers. In which the application run in the client devices such as smart phone, tablet, PDAs. But, the computation works are carried out in the cloud service provider to overcome the difficulties such as insufficient resources for processing, storage and battery. The requirements of proposed work are smart phone which are having the camera that capable of taking medium to high resolution images (preferably 5Megapixel and above) and also support for the Tamil Unicode format. There are many cloud service providers are available such as Amazon EC2, OpenStack, Open Nebula, Eucalyptus and so on. Among these providers, Cloud server will be deployed on the Amazon EC2 platform in the proposed work. The server receives image from the mobile clients to the cloud server that process these images. From these images, the required text information is retrieved using Optical Character Recognition (OCR) program. After processing, the result is send back to the user. Most server instances do not support OCR by default. As a result, a custom OCR program that supports the Tamil language should be installed on the cloud server.

The tamil OCR program consists of the following steps:

✓ Preprocessing:

The image received has to be first scanned and preprocessed. The image must be in a format that the OCR software can recognize so that we can retrieve the required data from it. After preprocessing, the OCR must be able to recognize the business card in the image and its dimensions alongside eliminating the excess background data. The image may further be skewed at a certain angle. The OCR program must be able to detect and fix the name of the person, position, mobile number email id and corresponding address.

✓ Feature Extraction:

In feature extraction, the OCR isolates and detects all the characters in the image individually. The characters are identified by precisely calculating inter line spaces, horizontal spaces, width of the character and pixel concentration in various regions. The horizontal and vertical line detection algorithm has been implemented in the literature to retrieve the entire information from the image.

✓ Classification:

Once the text has been extracted, the OCR intelligently recognizes and matches the text according to underlying design. The design contains common fields such as name, phone number and organization name. The final result is then returned back to the mobile client in the HTTP response.

The cloud server can parse the information to adopt with end user devices using JSON string that contain JSONArray and JSONObject data variables. The final contents are displayed to the user in the available Text View of user device. The tamil contacts are saved in the smart phones.

4. EXPERIMENTS AND RESULTS

Input:

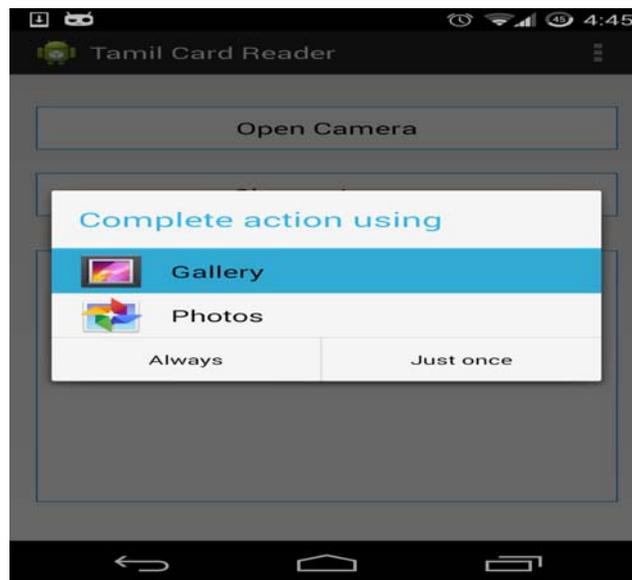


Fig 4.1. Mobile client user interface.

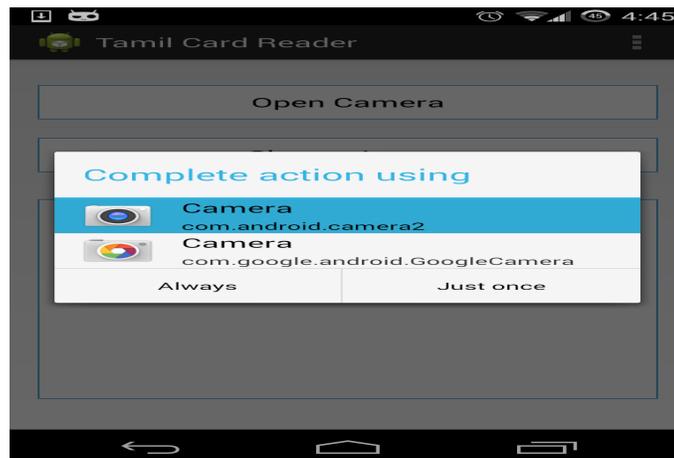


Fig 4.2. Smart phone capture image

The fig 4.1 and 4.2 capture the business card either from visiting card or retrieving from the gallery.

Output:

Fig 4.3 describes about the template that contain the selecting the required information such as name, designation, address and mobile numbers.

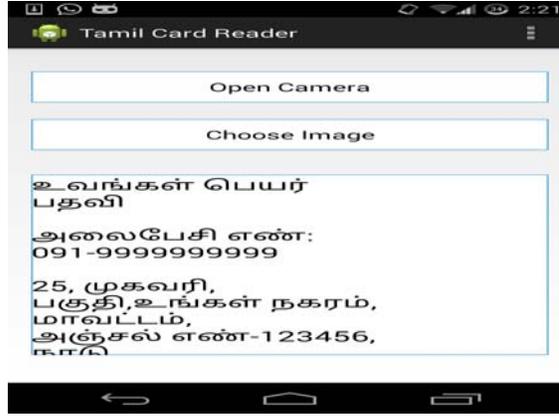


Fig 4.3. Template

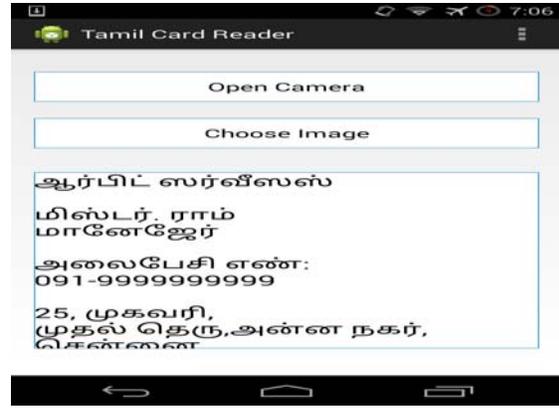


Fig 4.4. Sample data

Fig 4.4 describes the sample information which can be retrieved from the business card.

5. CONCLUSION

In this article, business card reader in Tamil is implemented in mobile cloud platform. The cloud server utilizes the Tamil OCR to process the image which is received from the different mobile clients. The relevant information is retrieved from the tamil OCR and send back the result to the devices. There are various challenging issues are faced while fetching the text from the complex background. Further work could explore in Tamil OCR to efficiently process the text segmentation in the cloud server.

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