CLOUD BASED MOBILE PUBLIC TRANSPORT ASSISTANCE FOR VISUALLY IMPAIRED PEOPLE

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Abstract

Travelling in public transport is a challenging task for visually impaired people. Now days, people are equipped with smart phones which will also be helpful for visually impaired people. This paper focuses on developing a location based mobile transport assistance system in Tamil language for visually impaired people. Since mobile phones has limited resource constraints such as low memory, and limited computation power, Cloud environment has been integrated with mobile phones, in order to provide the infrastructure where the data storage and data processing can be supported externally from mobile. Today many smart phones are equipped with Global Positioning System transceiver, Global System for Mobile communication receiver and inertial sensors which would identify the current location of the mobile user easily and its location could be sent to an Amazon Web Service Cloud platform immediately. Hence the mobile user's location could be processed in the Cloud to obtain the location based transport information.

Moreover, this work presents a technique for converting the retrieved textual transport information to audio in Tamil language using Cloud environment. Text-to-speech synthesis converts ordinary text image into an acoustic signal that is indistinguishable from human speech. The conversion process consists of two parts which involves knowledge and processes. The front end handles text analysis and higher level linguistic features which interprets the text and outputs in the form of phonetic transcription that specifies the phonemes and an intonation for the text. The back end handles problems in phonetics, acoustics and signal processing. Further, the phonetic transcription process into an audio waveform contains appropriate values for acoustic parameters such as pitch, amplitude, duration, and spectral characteristics. Thus the proposed system provides the guidance and assistance of location based transport details by enabling audio for visually impaired people in the native language. The development of this system would contribute a lot to visually impaired community.

Keywords: Mobile Cloud, Tamil Text to audio converter, Smart phones

1. INTRODUCTION

Smart phones support wide range of applications such as games, image processing video conferencing, e-commerce and other online social network services. High computation power is required to execute these applications in smart phones. This is a challenging task because Smart phones are resource constraint devices with limited computation power, storage and energy. Therefore, many applications are unsuitable to run in smart phones. To overcome, the issue of mobile, Cloud computing offers virtually unlimited dynamic resources for computation, storage and resource provision. The integration of mobile and cloud computing is termed as 'Mobile Cloud Computing'. Cloud based computation offloading technique is used to enhance the performance of the application due to insufficient resource constraints of smart phones.

Mobile Cloud Computing technology turns smart phones into powerful device for the visually impaired people. As smart phone becomes more advanced, it requires more effort to make mobile phone accessible to visually impaired people. Inability to sense the surrounding environment, poor orientation, and navigation capabilities, difficulties in accessing textual information result in limited mobility of the visually impaired [3]. Added to this, visually impaired people find difficulties in identifying Points of Internet (PoI) like street name, bus stop, pedestrian crossing to rectify. To overcome this situation, Electronic Travel Aids (ETA) has been developed for visually impaired people. This electronic system helps visually impaired in their mobility, communication and in accessing various public services. To calculate accurate information on user location for e.g., in

moving from one place to another, related data are retrieved from public transport passenger information system. Cloud server provides the information about bus number, route, arrival and departure timings. Cloud, the server stores public transport information data. Dedicated terminals equipped with GSM/UMTS transceivers, GPS receivers, inertial sensors and camera are used to obtain precise user local information to provide communication channel to remote assistant of the user, and to present voice message to the user [4].

2. RELATED WORK

Mobility of the visually impaired requires rich terminology because different implications are assigned to this concept. At the outset, the problem faced by the visually impaired people during their commutation should be analyses – space perception, orientation way finding, navigation, obstacle detection and avoidance, landmark and shoreline. This issue of the visually impaired people can be solved by using ETA services. ETA encompasses a large class of assistive devices which supports the capability of Oriented and Navigation System (ONS). This system assists the blind users in travelling to far and unfamiliar places. This system offers sensing of far spaces and can acquire data from larger scale distributed network e.g. sensor network, digital maps or GPS [3]. This system has brought a new solution for assisting the blind in mobility and travel. Many technologies have been involved to find the solution for the visually impaired people like Global Positioning System (GPS), Geographic Information System (GIS), and wide access to the Internet, wireless communication network (e.g., Wi-Fi, GSM). All these can be connected to other nearby device via Bluetooth link and can communicate with cloud server.

A variety of techniques can be employed to estimate the position of a wireless network terminal. In majority of systems, measurements of signal parameters are transmitted by system reference stations. Then, the position of the terminal is estimated based on calculation of distances of the terminal to at least some of the reference nodes. The most commonly used signal properties include propagation time, angle of arrival and received signal strength [5].

Digitization technology has been applied in many fields in people's daily lives, such as retail businesses, post offices, insurance and aircraft companies [3].

3. PROPOSED WORK

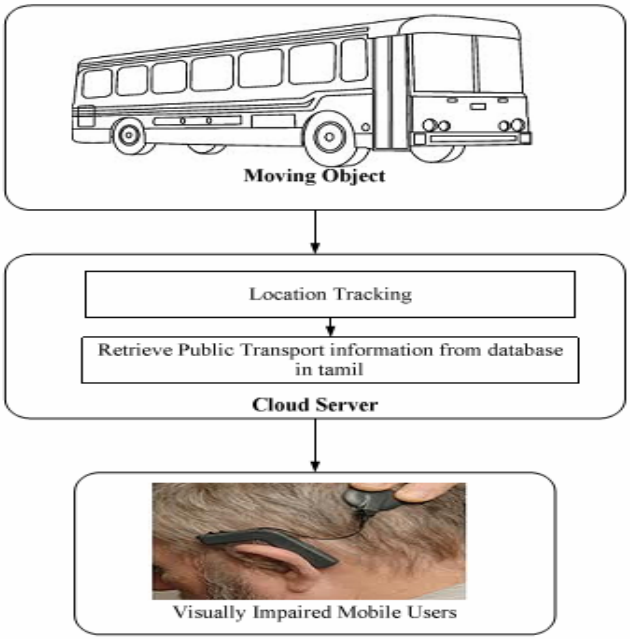

Fig3.1 Client Server Architecture for public transport assistance cloud

In this figure 3.1,The mobile user send the destination to the cloud server. Through GSM/GPS service, the current location of mobile users is tracked by the cloud server. This Server provides accurate information on user location moving from one place to another, related data are retrieved from public transport passenger information system. Public transport information in Tamil is send to the mobile clients through http response. Text to speech synthesizer tools in mobile coverts the tamil text to audio signal. This audio output is given to the visually impaired people.

The cloud server receives the destination form the mobile users and calculates the distance by using the latitudes and longitudes. The minimum and maximum latitudes are calculated using the following formula (3.1) and (3.2). Similarly, the longitude is calculated using (3.3), (3.4) (3.5) and (3.6).

latitudemin = latitude – radius of earth (r) (3.1)
latitudemax = latitude + radius of earth (r) (3.2)
latitudeT = arcsin(sin(latitude)/cos(r)) (3.3)
longitudemin = longitudeT1 = longitude – Δ longitude (3.4)
longitudemax = longitude + Δ longitude (3.5)
Δlongitude = arccos((cos(r) - sin(latitudeT) • sin(latitude)) /
(cos(latitudeT) • cos(latitude))= arcsin(sin(r)/cos(latitude)) (3.6)

The distance is calculated and the the route of the bus information is retrieved by using the direction search algorithm.

Direction Search Algorithm

This algorithm provides solution to the queries on direction.

Algorithm: Direction Search

Input : Root of node N, Set of locations S, Objects P and directions

Output : Object selected based on directions

Step 1: Assume the initial root node as the node N
Step 2: Every edge e depends on its parent node N
Step 3: If node N is a non-leaf then
Step 4: Read the child node N pointed by e;
Step 5: Assume x and y as latitude and longitude values in spatial region.
Step 6: If the object P with latitude (p.x) is greater than the location object S with latitude (s.x) then
Step 7: Search the object P in east direction
Step 8: else
Step 9: Search the object P in west direction
Step 10: If the object P with longitude (p.y) is greater than the location object S with longitude (s.y) then
Step 11: Search the object P in north direction
Step 12: else
Step 13: Search the object P in south direction
Step 14: Retrieve the object selection based on direction.

4. EXPERIMENTS AND RESULTS

Input:

The mobile user sends the destination in tamil i.e. central. Through GSM/GPS, the current position of the mobile user is identified by the cloud server. Based on the destination, the relevant information is searched in the public transport assistance database. This is shown in figure 4.1.

Figure 4.1.Mobile client

Figure 4.2 PTA Cloud

Output:

The distance is calculated by using the latitude and longitude. The bus route no, source place, destination place and the timings to reach the destination is retrieved from the database .This is given to Tamil and displayed as audio output to the mobile clients.

5. CONCLUSION

This paper has presented a prototype implementation of a mobile Public transport assistance information management system based on Cloud Computing and Android OS. The Position of results is returned as contextual information regarding the area where the user's localized. The use of smart phone as a user terminal makes it possible to present the results to the users in the form of voice messages. Future work might include location tracking of mobiles and implement cloud ranking to prioritize the continuous Query in the server.

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