

An Outdoor Navigation With Voice Recognition Security Application For Visually Impaired People

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Abstract— Blind guide is a technology in navigation systems for visually impaired people. It is designed to provide dynamic interaction and the ability to change to fit changed circumstances guided with the use of audio instructions. To make the blind people active and independent it bring up the confidence and participation as possible. Blind guide is a software application which can be entered into the app after a successful login by the user using voice recognition security. A voice recognition security process is used for the blind users. Voice recognition technology is the process of identifying and understanding the voice signals of users. A unique features of the users voice are extracted and stored at the time of registration. This stored information is compared with the users voice sample. Blind guide provide the information and guidance to move from one place to another safely using android base smart phone. TTS (Text to Speech) is used in navigation system to provide navigation through voice for blind people. Also it uses Google map API to apply map information.

Keywords— TTS, Visually Impaired Persons, Navigation System.

I. INTRODUCTION

As our society farther expands, there have been many supports for second-class citizens, disabled. One of many supports that is urgent is the guarantee of mobility for blind people. There has been many efforts but even now, it is not easy for blind people to independently move. Artificial Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The statistics by the World Health Organization (WHO) in 2011 estimates that there are 285 billion people in world with visual impairment, 39 billion of people which are blind [1].

As electronic technologies have improved, a research about Electrical Aided: EA for blind people has started. With a current product, Human Tech of Japan developed Navigation for blind people, using GPS and cell phone. The oldest and traditional mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The drawbacks of these aids are range of motion and very little Information conveyed. With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) [2] designed and devised to help the blind people to navigate safely and independently.

In this paper, a research of a navigation system for blind people is written in order to provide more precise location information. To identify the position and orientation and location of the blind person any of those solutions rely on Global Positioning System (GPS) technology [7]. The application suggested in this paper uses TTS program and Google Maps APIs in order to provide navigation with voices This suggested system uses Smart Phone which is less tiring to use, and it is fairly cheap and provides an easier mobility.

Voice recognition technology [11] is the process of identifying, understanding and converting voice signals into text or commands. There are different types of authentication mechanisms available today like alphanumeric passwords, graphical passwords etc. Along with these, biometric authentication mechanisms like fingerprint recognition system, voice recognition system, iris recognition system etc. add more security for data. This voice recognition technology consists of two different technologies such as speaker recognition and speech recognition, which are both considered to be emerging areas of research. Speaker recognition is the process of identifying the exact user who is speaking. It involves two systems – speaker's voice identification and speaker verification. Speaker identification involves identification of the unique speaker's voice from a set of other voices. This is done by inputting a user's voice into the recognition system. This recognition system stores a set of all known user's voices. From the input voice, the system needs to identify who is the speaker from the available list of voices. Thus the speaker identification system works within a closed set of data. In speaker verification system, a user's given voice sample is verified to check whether the user is valid or not. This is done by comparing the user's new voice features with the stored voice features. This is carried out for the purpose of authenticating the user.

II. BACKGROUND WORK

According to recent statistics from the World Health Organization, 285 million people are visually impaired worldwide: 39 million are blind and 246 million have low vision. Increasing mobility, safety, and independence for the visually impaired is of significant importance, making it a frequent research topic. Several mobility aids for the blind exist, although the blind cane is lightweight, cheap, and relatively sturdy, making it by far the most widely used. However, a typical white cane does have some drawbacks,

namely a substantial ‘hidden cost’ of learning how to use the cane effectively, and that the user can only sense objects that the cane touches directly. Since canes are held out in front of the user and swept along the ground from side to side, only objects close to the ground and within the range of the cane will be detected, making overhanging obstacles impossible to detect. An intensive effort over the last 40 years has gone into technologically-based assistance for the blind, and the use of ultrasonic sensors in this pursuit is nearly as old. Yet widespread adoption of electronic travel aids (ETAs) has failed to manifest. Of the 25.2 million people in the U.S. who reported significant vision loss in 2008, only an estimated 19,500 were users of ETAs. This slow adoption rate of ETAs has been attributed to lifestyle incompatibilities, low quality of information about specific ETAs, and the high cost of most ETAs. Our objective was to design a device that could detect overhanging objects while also fostering wider adoption among visually impaired cane users. The ioCane system was designed after preliminary interviews with 15 blind cane users in order to best identify pain points and potential areas for improvement in cane design. In this paper we present our first prototype of the ioCane: a wireless, lightweight, inexpensive system designed to snap onto a user's existing white cane that interfaces with an off-the-shelf Android mobile phone to provide integrated sensory feedback to visually impaired users. To our knowledge, the ioCane is the first sensor-based mobility assistance system to integrate seamlessly with commodity mobile phones without any modifications, as well as the first system of its kind to be evaluated by visually-impaired cane users.

A. Voice Recognition Based Secure Android Model:

Voice recognition technology [11] is the process of identifying and understanding the voice signals of a user, which is converted into text or commands for a program. In this work the voice recognition technology is applied into a laboratory information system for identifying each technician's voice. i.e. By using the user's voice sample, a secure authentication system is developed where the unique features of the user's voice are extracted and stored at the time of registration. Afterwards during the login stage, unique features of the user's new voice sample are extracted. Then compare the features with all the stored features rather than the just previous one. For this, a unique username is set to all the users. The comparison operation is performed with all voice samples under that particular user name. The voice feature comparison process is done by using Fast Fourier Transform techniques. After a successful login the user can enter the results of smear test through his voice rather than typing into the system. The research “Voice Recognition Based Secure Android Model for Inputting Smear Test Results” is successfully implemented and different kinds of test criteria are applied. In this the text to be read by the user is given to him by the system. If the text size is small i.e. the voice input is of small duration the identification procedure is little bit difficult. But in the case of large text the system is correctly recognizing the user. In this system each time different text is displayed to the user for his authentication

purpose, so the accent, frequency, style etc. of each user can successfully identified. If the speaker uses the system in a noisy environment then the authentication procedure is difficult. So this system will successfully work in non-noisy environment. In this system two stages of authentication procedure is performed. In the first case the user should give a username for his entry into the system which must be unique. In the second stage he or she should submit their voice sample to the system for successful authentication. The submitted voice stored under the particular username. These two stages created a successful authentication system based on voice. Human voice is an important biometric and can be used for authentication purposes. In this research human voice is set up as an authentication key. A speaker identification based secure android model is developed in this research under the voice recognition technology. The voice recognition is done based on Fast Fourier Transform. to use this document as a template and simply type your text into it.

III. EXISTING SYSTEM

ioCane : A Smart-Phone and Sensor-Augmented Mobility Aid for the Blind

ioCane, a mobility aid for blind cane users that uses detachable cane-mounted ultrasonic sensors connected to a circuit board to send contextual data wirelessly to an Android phone application. The system uses the built-in mobile phone modalities of vibrations and chimes to alert the user to object height and proximity. We believe this plug-and-play solution for visually impaired users has the potential to enhance user mobility and object avoidance with a minimal learning curve. To our knowledge, the ioCane is the first sensor-based mobility assistance system to integrate natively with a mobile phone without any modifications to the phone or the system, as well as the first system of its kind to be evaluated by actual visually-impaired cane users [13].

One of the primary advantages of the ioCane system is its plug-and-play integration with the Android OS, allowing the ioCane app to make use of available smart phone capabilities. We have identified several potential extensions in this vein that would make the ioCane even more useful as an ETA for the blind. We have begun work on one such addition: curb detection from a camera phone. Most Android phones have cameras, so we sought to use computer vision algorithms on camera input to detect objects of interest, effectively providing an additional layer of sensing ability to the system. Preliminary interviews indicated that detecting curbs was a common difficulty, so we developed an algorithm that runs with our app to detect curbs. The algorithm utilizes a two-phase approach that runs a Canny edge-detector through a Hough transform to detect horizontal lines that are likely to be curbs. Our early implementation of the algorithm gives voice prompts from the phone when a likely curb is detected. Although the implementation is complete, we have not yet had time to evaluate it. Should this approach prove useful, a variety of common-interest objects could be identified and integrated into our system. It should be noted that work has

been done on recognizing zebra-crossings , but not from a cell phone camera and not including regular curbs.

The ioCane, a mobility aid for the blind, is the first system to integrate an ultrasonic sensor array with Android phones. Obstacle avoidance is achieved through haptic and audio feedback that correspond to the distance and height of an approaching object. We also present novel algorithms for dynamically determining the cane angle to the ground, estimating the canes location in space, and calculating the height of interfering objects based on sensor data and the user's height. By using common parts, the ioCane is both cheaper and more extensible than existing ETAs. A user study with blind cane users revealed a 47.3% improvement in obstacle avoidance after only 30 minutes of training time, a fraction of the normal training given to blind cane users.

IV. PROPOSED SYSTEM

A. ANDROID:

Android is a software stack and mobile operating system that includes the operating system for portable devices, middleware, user interface, and a standard application , multimedia message service (MMS). Android developers were able to write applications in the Java language, a runtime library that can run the compiled byte code. In addition, it provides the required application through the Android Software Development Kit (SDK) to develop a variety of tools and APIs. Android works on the Linux kernel and the Android system uses C / C + + libraries, etc. are included. Android, unlike existing Java virtual machines, uses an Java application made of Dalvik Virtual machine that runs on a separate process. In 2005, Google acquired Android Inc. and in November, 2007, Google announced to freely open Android platform to the public. After the announcement, 48 different hardware, software, and communication companies collaborated to design Open Handset Alliance, OHA and it has been developing an open-to-public standard. Google distributed all source code of Android as Apache v2 license so that companies or users can independently develop Android program. A construction of Android is shown in figure 1 as followed. In these construction components, it is divided into a total of 5 class of application, application framework, library, Android runtime, and Linux kernel. Handset layout platform is adaptive to expand 3D graphic library based on OpenGL ES1.0, VGA, and 2D graphic library, and it uses SQLite database software for a purpose of data storage. Android supports connection technologies including GSM/EDGE, CDMA, EV-DO, UMTS, BlueTooth, and WiFi. It also supports a web browser based on an open source, Webkit application framework and it allows the usage of touch screen that is supported by additional hardware, GPS, acceleration sensor, compass sensor, and 3D graphic acceleration.



Fig 1.

B. GPS(Global Positioning System):

GPS is a radio navigation system using satellites and it is developed by USA Department of Defense for military use navigation but it can be used by citizens with a limited range. It predicts radio coverage from satellites to a receiver, then it shows the exact 3D location, speed and time. This system can be universally used for 24 hours, and many people can use it. This GPS system can be divided into 3 different segments; SS (Space Segment), CS (Control Segment), and US (User Segment). SS (Space Segment) represents the location of 24 satellites that rotate around the Earth every 12 hours. As of April, 2007, there is a total of 36 GPS satellites with 30 of them are active and 6 of them are preparatory satellites in case of malfunction. CS (Control Segment) represents a general observation post that manages and tracks GPS satellites. US (User Segment) represents GPS users and GPS receiver [2].

C. LBS(Location-Based System):

LBS service indicates a wireless contents service that provides certain information based on the location change of the user. Developers of mobile handset have voluntarily tried to install LBS within their devices. However, LBS was originally developed by telecommunication companies and mobile contents providers. Main benefit of the system is the fact that the users don't have to directly insert location as they move. GPS positioning technology is one of important technologies that allows easier access of wireless internet service. However, in order to materialize LBS, there are more related technologies other than GPS and satellite based technologies. Within mobile communication network, there exists a management mechanism in order to manage a mobility of cell phone and there are many GPS LBS service based on the mechanism. Movements of LBS can be seen in three different parts; Positioning technology, lay-administered platform and location application.

1) Positioning Technology: Service provider can predict any location using GPS chip within wireless device. In this case, the positioning technology directly manages a calculation of location using received signal from satellite. Once the calculation is done, a variety of information can be received through mobile communication network. Depending on

Mobile communication network or location information service, the system sometimes uses a single base station based information, rather than multiple base stations. Since mobile communication network, characteristically, constantly manages the mobility of cell phones, this positioning technology method can be a method of providing LBS without any additional position technology and any calculation from requests of location. The accuracy of location estimation is at the maximum when the location was estimated using GPS and the matching satellite based location prediction method. On the other hand, a base station method has the lowest accuracy of predicting location since it only allows predicting a certain part of region rather than a coordinate. LBL service can be materialized using other methods other than what are currently shown. Within current mobile communication network, there exists a variety of end terminals that have different method of predicting location. Therefore, normal mobile communication companies combines GPS, A-GPS and a base station based method to provide LBS.

2) Lay-administered Platform: A lay-administered platform is a general word for LBs service components that achieves and process user location from position technology and provides information to application through an interface with network. Within network models based on GSM, CDMA, GMLC(Gateway Mobile Location Center) has been defined as a facility that request a base station based routing information by interlocking with management system in the inner part of mobile communication service and functions as a gateway of interlocking with LBS application within IP network. These GMLC can be sorted out to be one of LBS platforms within mobile communication network.

3) Location application: This application represents a service that provides already processed contents based on locations of individual user or an object through communicating with lay-administered platform or that can manage collected location information [3].

D. MODULES:

- 1) *Voice Information Storage*: During the transactions, first transforms the user's voice information into digital signals and stores the digital signals in specialized voice database. Then the server will send new voice to a voice recognition system, where the voice will be denoised and the voice features will be extracted. After the voice features extracted successfully, the features information will be automatically sent to the voice features database for subsequent voice recognition
- 2) *Voice Recognition*: Voice recognition mainly consists of following steps:
 - Receiving the user voice signal,
 - Using normalization to denoise,

- Extracting feature and
- Comparing the voice features.

Specifically, the user's voice signal denoising and feature extraction of voice are completed by the android. The system finds the latest voice features in its database for the user and compares them with the voice features. If it's found that the voice features consistent with each other, it also indicates that the voice recognition is passed by the system and the user is legal. Accuracy of the voice should be as follows,

- Error rates increase as the vocabulary size grows
- Speaker dependence vs. independence:
A speaker-dependent system is intended for use by a single speaker.
A speaker-independent system is intended for use by any speaker, more difficult.
- Isolated, Discontinuous or continuous speech
With isolated speech single words are used, therefore it becomes easier to recognize the speech. With discontinuous speech full sentences separated by silence are used, therefore it becomes easier to recognize the speech as well as with isolated speech. With continuous speech naturally spoken sentences are used, therefore it becomes harder to recognize the speech, different from both isolated and discontinuous speech.

3) *Voice Features Update*: The android should not only accept the input voice information, but also update the voice features timely. We collect enough historical information and summarize new law, and establish a system for regularly view of the user's voice features to update the voice features timely.

4) *Route navigation*: Route navigation services help people get from one place to another. Navigation tracking, often with a map "picture" in the background, but showing where you have been, and allowing "routes" to be preprogrammed, giving a line you can follow on the screen.

5) *Track user*: A track is a trace of somewhere that you actually been. The GPS unit periodically sends details of the location which are recorded by the software, either by taking a reading based on a set time interval, based on a set distance, based on a change in the direction by more than a certain angle, or a combination of these. Each point is stored together with its date and time. The resulting track can be displayed as a series of the recorded points or a line connecting them retracing your steps is a simple matter of following the track back to the source.

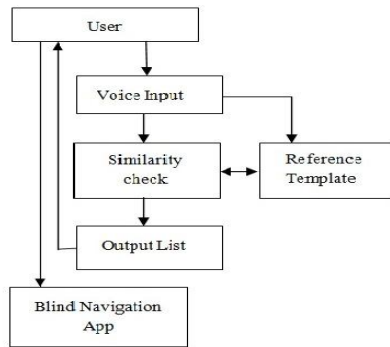


Fig 2.

The application developed in this paper functions through voices. A voice recognition security authentication is done to authenticate the user. After a successful login. Smart Phone recognizes the voices, search for destination, routes, and provide the route to the user through voice. Figure 2 shows a architecture of proposed approach. The functions of the application developed in this paper are as followed.

The first function is to search destination through voice recognition and Google TTS service. After voice authentication, users say the wanted destination according to the instruction. In case of unclear voice, the message saying ‘speak once more’ will pop up and users say the destination once more clearly. If the application asks for confirmation of destination, the users say, ‘yes’, if the destination is correct.

The second function is route research using Google Map. After users have confirmed the destination, the application materializes the map after searching for route from the current location of the user to the destination.

The third function is to guide the users with voice. Using DB of Smart Phone, it sees the route to the destination and it begins to guide by saying travel range, and direction for each section of the route.

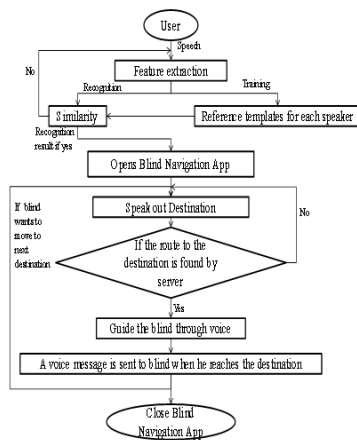


Fig 3.

Figure 3 shows the hierarchy of service. The application developed in this paper functions through voices. Smart Phone recognizes the voices, search for destination, routes, and provide the route to the user through voice.

V. CONCLUSION

In this paper, it designed a navigation system for blind people in order to provide precise location information. Suggested system, as an independent program, is fairly cheap and it is possible to install onto Smart phone held by blind people. This allows blind people to easy access the program. The developed service utilized Smart Phone in order to search route between the current location of user to the destination and provide a voice-navigation.

The test of the application functions were done by using Android 2.2. As the result, voice support on route was successfully proven to work without any troubles. Further researches have to be continued in order to provide the users about the information on the obstacles using sensors connected to Android mobile. The navigation system uses TTS(Text-to-Speech) for blindness in order to provide a navigation service through voice. Also, it uses Google Map API to apply map information.

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