



SURVEY OF ASSISTIVE TECHNOLOGY FOR THE VISUALLY IMPAIRED AND BLIND PERSONS

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Abstract-

Assistive technology is any device, software or equipment that is used to help individuals with disabilities. A report prepared by WHO indicates that globally the number of people of all ages virtually impaired is estimated to be 285 million, of whom 39 million are blind. For a number of years researchers have developed assistive technology for overcoming difficulties and challenges faced by visually impaired and blind person. This paper provides survey of recent developments in audio and tactile feedback based assistive technologies which are developed for blind person. Due to recent development in the technology, applications now can be developed and run on mobile and portable devices. As a result, electronic travel aids, navigational assistance modules, text-to-speech applications, as well as virtual audio displays which combine audio are becoming integrated into standard mobile devices. This move, combined with the user-friendly GUI and modes of interaction has opened new door for the development in visually impaired and blind person. This paper will help new researcher to future research in mobile interaction design with respect to users with special needs.

Keywords— Assistive Technology, Visually Impaired, Blind Person.

INTRODUCTION

The numbers of visually impaired and blind persons are rapidly increasing. These people find it difficult to move in the surrounding environment, especially which is not very familiar to them. Initially, most people were relying on the white cane and guide dog for navigating from one place to another. However due to these tool they cannot get all the necessary information regarding the surrounding. To overcome these problem various navigating tools has been designed. These navigating tools are generally equipped with various types of sensor and processor which is capable of making decision. Various feedback components are used to communicate results effectively. Now a day mobile devices has huge computing power therefore it provide great promise to handle such challenge. Also it has touch screen and rice auditory output. Therefore it can provide a wide spread platform for implanting assistive technology for blind persons [1].

In this paper, our aim is to provide an overview of the solutions designed for the visually unpaired and blind person. Also some recent developments in mobile technology are discussed.

LITERATURE REVIEW

In this we will see the commonly used sensory aids for visually impaired persons. The most commonly aid for the blind person is white can. The can only give information about the area up to two feet ahead of the users. This can sometime be increased by tapping the cane and estimating a frame of references by analyzing the echo of the sound. It is low cost, mechanical and can only find obstacles through touch. The person can also use Guide dog, its cost is high and not easily available also need career.

A) Ultrasonic sensors:

To increase the accuracy scientist made use of computer technology to help blind people. They made use of variety of sensors to acquire the information of the surrounding. Ultrasonic sensor is such sensor which can be used to find obstacles. Ultrasonic sensors have transmitter as well as detector. The time between the sending and

receiving of pulse determines the distances at which the reflected surface is away. It has one problem that signals reflection or absorption may result in false information [2].

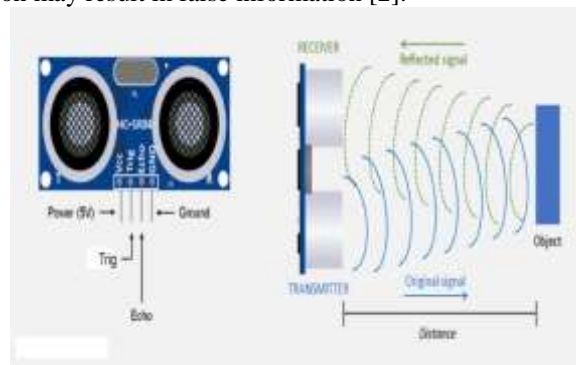


Fig.1. Ultrasonic sensors functionality

B) Infrared sensors:

IR sensors measure the light emitted by objects in the nearby region. They are made up of a transmitter and receiver. If the light rays received on the receiver side are stronger, accuracy is more. The popular applications for IR sensors are in the Kinect and Wii game controlling systems. The Kinect make use of IR sensors and stereo camera build a three dimensional representation of a scene. One drawback of IR sensors is it can only be used for short distances [2].

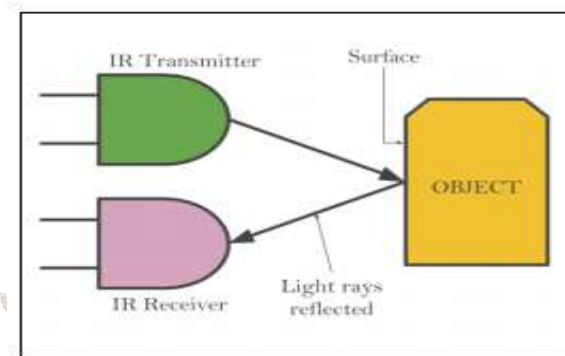


Fig. 2. IR sensor functionality

C) Camera:

Camera is also used in assistive technology for blind peoples. The size and price of camera has been significantly reduced over last few years while quality and capability has significantly increased. Camera along with computer makes use of algorithmic approach to analyze and extract information from images. With the improvement in algorithm the accuracy of this assistive technology is increasing. However it requires lot of computation power. In computer vision technique lot of research has been carried out. There has been lot of innovative application provided that involves embedding cameras in a variety of wearables. Xbox Kinect and Project Tango are the example of computer vision technique [3].



Fig. 3. XBOX Kinect

All the computation work done for these sensory aids were initially done with the help of microprocessor and microcontroller. But now with the improvement in mobile technology heavy computation work can also be done with the help of mobile. The mobile computing platform can be used to develop APIs for general purpose computing. It is providing a high level of flexibility to develop and distribute novel solution to user.

STATE OF THE ART APPLICATIONS FOR MOBILE PLATFORMS

Various applications which support visually impaired people in performing everyday tasks are offered by Android and iOS. Overview of various solution on this platform is provided in this section.

A) *Application for Android*

Some of the solutions for Android are shown in the subsection.

B) *Text, Speech and Typing*

For accessing anything on the mobile, android have a number of facilities for text-to-speech based interaction. Talkback, Kickback and Soundback are some applications which are designed to help blind and visually impaired users. This application allows blind people to hear and put their selections on the GUI. This application can also read the text loudly. Talkback has very good sound quality and is good as compared to other for screen readers for PCs. To get good quality a proper version of SVOX must be installed. It also has operating vibrating feedback. The IDEAL Accessibility Installer, also known as the Platform Access Installer, was designed by Google to be a complete package of Google's Android Accessibility programs. This app contains packages for blind or visually impaired people that will help them get through with operating their mobile phones.

Visually impaired persons usually face difficulties in navigating their phone. They are limited on the things they can do let it be reading a book or texting someone. However, application made by SVOX Mobile Voices that will eliminate the problems of most visually impaired people with the use of the Classic Text to Speech Engine application.[4]

C) *Speech-based command interfaces*

The eyes-Free Shell is an alternative home screen or launcher for drivers and other people who don't or can't look at the screen. It gives blind and visually impaired users a way of interacting with the touch screen to check status information, launch other applications, and direct dial or message a contact. The Eyes-Free Shell has several parts. The main screen has 7 widgets or mini-apps that offer users quick access to information like time and battery status. It is the screen that opens when the Shell is launched. In addition to the main screen, the Shell has at least 2 other pages (called menus), where users can place shortcuts to things they use frequently. In fact, if the Shell appears to be blank as users attempt to interact with it, the likely reason is that they are on one of the shortcuts pages, not the main screen.[5] Just Speak is an type of Accessibility Service that uses Accessibility APIs on the platform to augment Android's user interface. Just Speak augments the Android user interface with voice-input control; other Accessibility Services which provide spoken feedback is TalkBack. Note that Just Speak can be used either by itself, or in conjunction with other platform Accessibility Services such as TalkBack. [6]

D) *Navigation*

Talking or speaking location is one app where blind person can shake the phone to get his/her approximate position with WiFi or mobile if there is no GPS available. In that the user can also Email or SMS his/her location to friends. Shake to change accuracy. It is free to use [7]. To facilitate straight-line walking several "walking straight" applications have been developed [8, 9]. This applications make use of built-in sensors (i.e. mostly the magnetic sensor) to help blind pedestrians. The possibility to make combined use of GPS receivers, compasses and map data comes through the augmentation of mobile capabilities with data services. WalkyTalky is one of the many apps created by the Eyes-Free Project that helps blind people in navigation by providing real-time vibration feedback if they are not moving in the correct direction [10]. The accuracy based on the in-built GPS can be low, making it difficult to issue warnings within 3–4 m of accuracy. This drawback can be overcome by having a better GPS receiver connected through Bluetooth. Similarly, Intersection Explorer provides a spoken account of the layout of streets and intersections as the user drags her finger across a map [11]. A more across-the-board application is "The voice" for Android [12]. The application maps live camera views to sound scapes, providing the visually impaired with an augmented reality based navigation support. The app provides following function a talking color identifier, talking compass, talking face detector and a talking GPS locator. It is also closely linked with the Zxing barcode scanner and the Google Goggles apps by allowing for them to be launched from within its own context. For brightness in one-second left to right scans of any view

“The voice” uses pitch for height and loudness: a rising bright line sounds as a rising tone, a bright spot as a beep, a bright filled rectangle as a noise burst, a vertical grid as a rhythm.

SUMMARY

There are certain areas where research can be done. There are different modes to convey information like audio, haptic or tactile. So the study can be carried out on which mode is suitable for conveying different information. Which mode user selects when users themselves are given the ability to allocate separate information streams to different presentation modes. The individual differences in the ability to process auditory and haptic information in single mode and multimode contexts.

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