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Recognizant: An Android Application for VisuallyImpaired People

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***Abstract*--** *This paper proposes an Android application for the blind people with the help of this application they can read books, any text, and any personal document using Optical Character Recognition System (OCRS) and inbuilt camera in a smartphone. This Mobile App helps the Visually Impaired person to devour medicine and fetch nearby area shop details for shopping. The Mobile App will be useful for a visually impaired person to recognize the stranger who is at door by using a face detection algorithm and recognition algorithm. Every time this App is activated it provides relatable Indian accent audio messages to visually impaired people.*

Keywords—*face detection, Low vision, Shopping, Mobile App;*

I. INTRODUCTION

This research work deals about design and developing, mobile App design especially concerned for visionless users. Universal Design is used in various fields, such as architecture and product design. This term was coined by the Architect Ronald L. Mace, this refers to the ideaof designing products to be exquisite and usable by everyone, irrespective of their age, capability or status in life. The most familiar adjectives used while referring to universal design are simple, intuitive, equitable, flexibility, perceptible or tolerance for error. The term Universal Design is closely related to other terms such us accessibility or usability [1]. With over view of the new technologies, the term accessibility is extended to Personal Computer accessibility. The bulk of the operative systems include new and innovative solutions for individuals with disabilities. Due to the growth of the Internet, there is a specific section inside computer accessibility dealing with web accessibility. Some authors have written about this topic, describing assistive technologies for web browsing: speech recognition, screen magnification or screen reader software.

In 1999, the Web Accessibility Initiative (WAI) published the Web Content Accessibility Guidelines WCAG [2], to improve the accessibility of the web for people with disabilities. Since the appearance of mobile devices, human-computer interaction has changed significantly, appearing new techniques for usability evaluation. The usability tests and evaluates the user interface and navigation issues in different environments. A radical change has occurred since the development of touch screen based mobile devices, such as the iPhone, iPad or Android devices. In less than a couple of years, gesture-based interaction has become a standard on the majority of mobile devices. It is an emerging area of research since touch displays are more and more present in our everyday life. Touch screens provide great flexibility and direct access to controls and information, but on the other hand, the physical feedback is lost, making them less accessible to visually impaired and blind users. The goal of our research work is to facilitate low vision users interaction with devices that use this kind of displays. This paper deals about the design of “Mobile App for Visually Impaired People” where a visually impaired user with the help of voice commands can access the services provided by this application. Despite the vast effort of hardware manufacturers to include accessibility features in their touch-based mobile devices, they are not good enough to obtain a good visually impaired user experience. Since most of the existing apps are designed for sighted users, the accessibility features are not always adequate to obtain a reliable result. Section II of this paper describes the literature survey of specific mobile apps for visually impaired users. In section III, the problems with the use of mobile devices for visually impaired people are being discussed. Later on, section IV describes some of the features of an application for visually impaired users.

Traditional apps such as telephone, calendar or contacts need to be reinvented. On the other hand, specific apps for blind users, such as text magnifiers or GPS, need to be effectively designed. Section V describes about system implementation and use of various tools and algorithms. The paper finishes with conclusions, which show the benefits of using our app for blind and visually impaired users.

II. LITERATURE SURVEY

A huge amount of information is available on the advancement of technology for visually impaired people which include the development of text to Braille systems and screen readers [3]. Kanan H. Ret al., have proposed an application which converts voice message into text format while sending message and text message into the voice format when it receives the message.However, the drawback of this proposed application is that they have designed a complex new interface for the complex graphical application for the browsing purpose and for the recognition of screenreader [4].

In the paper [5], Sharif Met al., gave information regarding the navigation system that uses TTS (Text-To-Speech) for blind folks. The planning and development of user Interfaces for voice application in mobile devices.This paper offers some data regarding an early model of voice application that uses voice recognition.

In paper [6], Nilesh, Jagtap et. Al., described the voice mail architecture used by blind people to access email and multimedia function of an operating system easily and efficiently. This paper mainly heeds on mailing and desktop applications. By using these functions, in our proposed application have enhanced functionality.

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III. PROBLEMS WITH THE USE OF MOBILE DEVICES FOR VISUALLY IMPAIRED PEOPLE

Widely publicized easy use of mobile devices offers theillusive impression that they're devices adapted for every user. Unfortunately, this is a truth, because, during the daily operation of their smart-phones or tablets, visually disabled persons must overcome a number of problems and inconveniences.

TouchScreen: Currently, the foremost necessary controller for mobile devices is "bit screen". It's a data input device layered on the top of a display of a smart-phone or tablet. The employment of this controller permits the user to eliminate problematic abstraction layer, that makes device dominant difficult to grasp i.e., for the elderly. The user will provide input by touching directly the screen or through simple or multi-touch gestures. However, the modification of physical keyboards to the touch screens, despite its undeniable advantages, makes mobile devices troublesome to use by a bunch of users - individuals with visual disabilities.

Voice Support: It is not tough to search out a mobile device that has provided voice support for visually impaired individuals. Most mobile systems, specifically Android OS and iOS, instantly give the screen readers. But they're not the right answer. Text To Speech engines (TTS) run in the background and sometimes consume several processor resources that slow down the operation of the device [9]. It delays the response time of the system, and consequently the frustration and confusion of the user who isn't ready to see what really happens with his phone, that at the same time deprives of voice messages.

UsingSwipes: Navigation using finger gesturescould be comparatively a new way to control mobile applications. However, it's widely getting used, thanks to its chance of imitation of natural movements, permitting the user to quickly learn the way to navigate within the program. Also, blind individuals will profit by using gestures for a mobile application. However, they must properly be chosen. Easy swipes are preferred, as close as possible to the natural. Writing characters (e.g. the question mark) ought to be avoided, as a result of characters form might not be well-known to the blind people. Each group may be used in applications designed for sighted individuals but writing characters is simply too complicated and need too much exactness in movements, therefore cannot be helpful for visually impaired people. The better option in this case will be gestures in terms of short lines, as they're less complicated and less absorbing.

IV. FEATURES OF AN APPLICATION FOR VISUALLY IMPAIRED USERS

a)**Pre Existing Features**: In order to confirm a decent user experience, it'll be vital that each one of the apps uses the same kind of controls to interact with the low vision user. The approach the user navigates through views among the app should be similar across different apps. To create this doable, the primary step is to spot those controls utilized by sighted users that may be additionally valid for low vision users. Button-Type management looks to be valid for each blind and sighted user. However, different controls like toolbars, divided controls, tables or information pickets would to be adapted to satisfy the low vision user necessities. At this stage, new controls for visually impaired users may well be additionally created. Once those controls are outlined, the next step is to make usability tests for those controls. The tests area unit used to study how the low vision user interacts with selected management.

On the usability test, measure the flexibility of the users

navigating across completely different views can be tested by identifying the controls and interacting with them. The definition and also the test of these controls can provide the low visual users with the required user expertise which will facilitate them to spot view elements and to navigate simply across any app of the portal. Voice over or the other TTS (text to speech) library would area unit used as a complement to the usable accessibility style.

b) **Enhanced Feature**: The disadvantage of the pre-existing feature is that it needs an internet connection to launch the text-to-speech API and needs screen control to hold the button for the voice input. By including the shake feature the application can be launched and the text-to speech API will run in the background and ask the input from the blind user.Through commands such as "scan", "buy", "search" the user can interact with the text to speech API to uniquely identify the category of functions. In facial recognition,Tessaract algorithm effectively recognizes the facial features to identify stored faces.

V. OBJECTIVE OF THE PROPOSED APPLICATION

The main objective of the proposed application is to build an android application for the blind people with the help of which they can read out books, any text any personal document using Optical Character Recognition system and inbuilt camera in smart phone ,it also useful to take medicine get the shop details in the nearby area and many more. The app should be useful for the blind person if any stranger is at door, the app will help the blind person to recognize the person at door. Every time this app provides some audio message to visually impaired people. Also, voice output should be provided in Indian accent.

VI. PROPOSED SYSTEM

The proposed system make easy for daily life activities work for visually impaired people. The following are the modules of Recognizant application for Android Smartphone.

i) Using Camera based smart phone and Optical Character Recognition system visually challenge people can read any document and read the text from scene image.
ii) Visually impaired people can identify medicine and get details about through voice command.
iii) Visually challenged person can recognize known and unknown person using camera based smart phone.
iv) They can read shop name while walking and get details about that shop.
v) When visually impaired people visit restaurants without anybody help they can read restaurant menu card using their smart phone application.

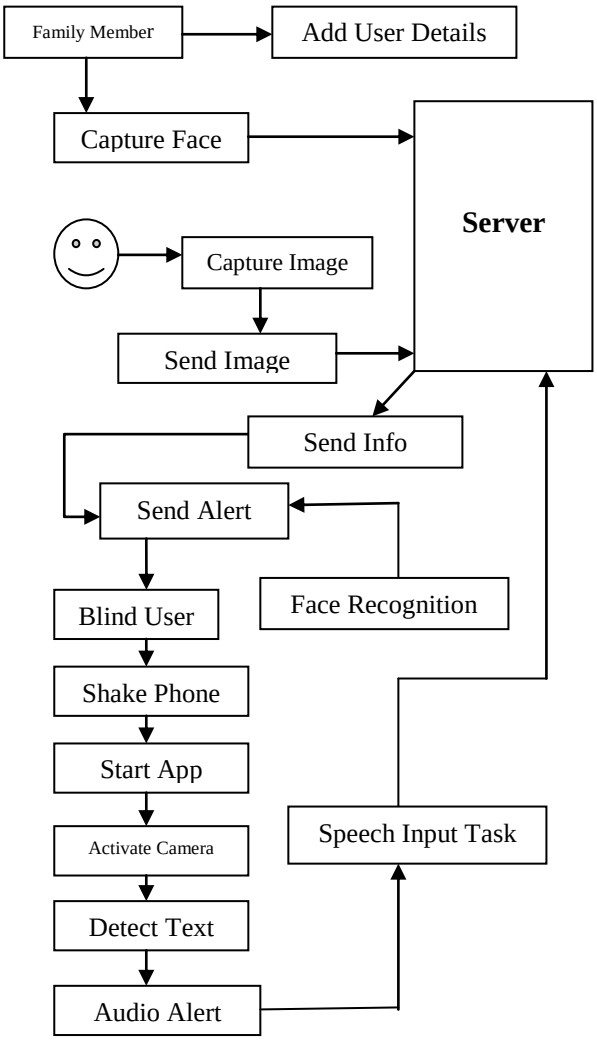

Fig 2: Architecture of Proposed Mobile App

All the feature provides visually impaired people voice output. This proposed framework not required any additional equipment; just need day by day useable Smartphone. Without the help of third person's dazzle, individuals can play out their daily activities. Architecture of proposed mobile app is as shown in figure 1.

VII. SYSTEM IMPLEMENTATION

a) Android:

Android may be a software stack and mobile operating system that features the operating system for transportable devices, middleware, user interface, and a standard application (Web Browser, Email consumer, SMS), multimedia message service (MMS). It provides the desired application through the android software Development Kit (SDK) to develop a range of tools and API's. Android works on the Linux kernel and also the android system use C / C + + libraries. Android has emerged as a new mobile development platform, building on past successes and avoiding past failures of alternative platforms. The Nielson numbers show Smartphone market tilting Android's way

that 37 percent of Smartphone users own an Android device as shown in figure 2.

The platform is open supply, with no up-front fees, and developers enjoy several advantages over different competitive platforms.

i. **Complete:**The designers had to take up a comprehensive approach when they developed the android platform. They began with a secure operating system and designed a robust software framework on high that enables for rich application development opportunities.
ii. **Open:** The android platform is provided through open supply licensing. Developers have unprecedented access tohandset features when developing applications.
iii. **Free:**Android applications are free to develop. There is neither licensing nor royalty fees required to develop on this platform. No needed membership fees. No needed testing fees. No needed signing or certification fees. Android applications may be distributed and commercialized in a kind of ways.

b) Methods Used:

i. **Text To Speech (TTS):** This is a method that converts speech from text. TTS is important for voice output for voice feedback for the user. Text to speech is implemented in software where audio capability is required. When a user enters voice command, TTS will convert that voice into text format and performs a specific action.
ii. **Speech To Text (STT):** Android has an inbuilt feature that is speech-to-text through which user can provide speech input to the software. In the background, speech input will be converted to text and perform an action in the form of TTS.
iii. **Cloud Vision API:**Cloud Vision API [7] enables the developers to easily combine vision detection features within applications, including image labeling, face, and landmark detection, optical character recognition (OCR), and tagging of explicit content.
iv. **Tensor Flow for Object Recognition:** Tensor Flow™ is an open source software library for high-performance numerical computation. Its versatile architecture design allows easy deployment of computation across various platforms (CPUs, GPUs, TPUs), and from desktops to clusters of servers to mobile and edge devices. Originally developed by Researchers and Engineers from the Google Brain team within Google's AI organization, it comes with robust support for Machine Learning,Deep Learning and the flexible numerical computation core is used across several other scientific domains.

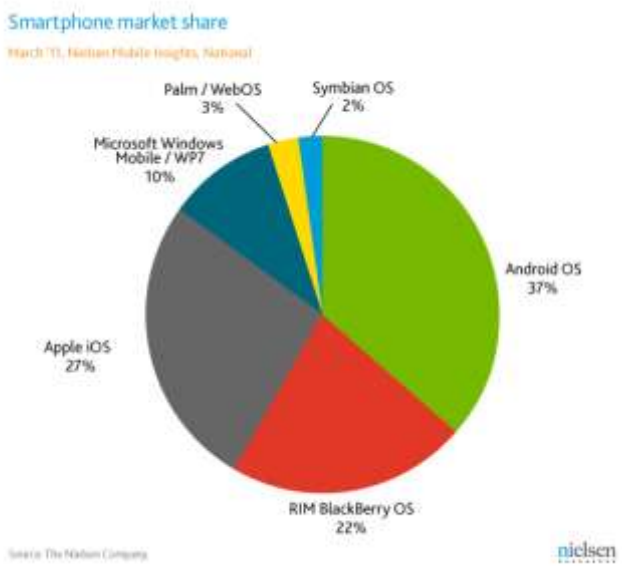

Fig 1: Pie chart representing a percentage of Android users

v. **Text Recognition:**Optical Character Recognition is the mechanical or electronic conversion of pictures of typewritten, handwritten or printed text into machine-encoded text [8]. It's the simplest methodology of digitizing printed and handwritten texts so they'll be simply searched, hold on a lot of succinctly, displayed and altered online, and employed in numerous different process tasks like language translation and text mining. One among the algorithms used is TessOCR [9]. TessOCR is an open supply optical character recognition engine.
vi. **Face Recognition:**Camera at the door clicks the picture when anyone comes, sends the image to the server. Server recognizes the face using Eigen face recognition [10] and sends an audio alert to the blind people's 30 phone saying the known person name or as unknown person.

The motive of the face recognition is to identify people using store database. When system accept input image then it mixed with many noise and very poor signal strength and also very much irregular data. After accepting image, it needs to transfer into Eigen face, so for that need to calculate matrix .To covert this image to matrix first it check dark spot in the face. After that in the image it capture all black spot and white spot .Then make all black more black and white more grey. Then it needs to find out distance between broader lines to every dark spot. According to the distance it may calculate matrix value. After that it starts matching operation using Eigen value method. After extracting data from image need to store those data .This whole process where face is convert into Eigen face is called PCA. It can be used to reconstruct main image by combining Eigen faces in the right proportion.

To reconstruct the original image from Eigen face, weighted sum of all Eigen face is needed Each Eigen face must have a weight. On the off chance that one uses all the Eigen faces separated from unique pictures, one can reproduce the first pictures from the Eigen faces precisely. In any case, one can likewise utilize just a piece of the Eigen faces. At that point the recreated picture is approximately same as that of the first picture. Be that as it may, one can guarantee that misfortunes because of precluding a portion of the Eigen faces can be limited. This occurs by picking just the most vital components (Eigen faces). Oversight of Eigen faces is essential because of shortage of computational assets.

Utilizing this weights one can decide two imperative things:

- Decide, the available picture being referred a face by any stretch of the imagination. For the situation the weights of the picture contrast excessively from the database of the weights of face pictures, the picture most likely is not a face.
- Comparable confronts (pictures) have comparative components (Eigen faces) to comparative degrees (weights). In the event that one concentrates weights from every one of the pictures accessible, the pictures could be assembled to bunch. That is, all pictures having comparative weights are probably going to be comparative appearances.

VIII. CONCLUSION

The descriptions of a product in the form of voice, within less span of time could able to get as output for proposed Recognizant Android Application for visually impaired people. In proposed application, the facility provided for visually impaired people to detect the text from any document such as a personal document, bank document, also able to read a restaurant menu card. It can recognize any sign board, recognize a medicine, and recognize known persons. This system will not provide much more accuracy but because of the androidSmartphone application, it gives a faster response to the blind people. This system consumes less hardware but provides better results which are userfriendly. All the features in the app start working using voice commands and visually impaired users accepts all output through voice instructions.

In future, instead of smart phone application smart glass will be used to detect known and unknown person, recognize the text and GPS location also. Face detection algorithm need to improve, so it can detect face in any position and light. Some artificial algorithm can be incorporate to recognize facial expression and mood of people. In case of text detection system need to support different language and it need to recognized data from long distance and different front size. Security framework need to utilize using some voice command or finger print scanner.

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