

# AWAAZ: A Bridge between Android Phones and the Visually Impaired

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## ABSTRACT

In this paper, our android application aims at helping visually challenged people who want to use the android based smart phones. The GUI of the application is designed such a way that anywhere they touch on the android smart phone; they can do the task they want to. The application inputs would adjust themselves with respect to the touch of the user. The GUI would recognize the gestures drawn by the user on the screen and execute particular functions corresponding to the gestures drawn.

## Keywords

Android, natural language processing, text to speech, visually impaired, voice commands, vibration feedback, Haptics.

## 1. INTRODUCTION

For absolutely visually impaired individuals from numerous points of view, the utilization of cell phones, particularly the most recent ones is to some degree like the utilization of personal computers. The greatest comparability is that most telephones are hard to be utilized without assistive advancements, or if nothing else manufactured in openness functionalities. A more unpredictable cell telephone obliges an a screen per user or a voice acknowledgment framework to capacity well for individuals who are thoroughly visually impaired. When cellular telephones began to develop available, their availability was less intricate. Visually impaired individuals basically needed to remember the format of the telephone's keypad, which is very much alike to consistent telephones, essentially with two additional required keys, send and cross out. After taking in these keys, it was conceivable to utilize the majority of the telephone's usefulness, even without having the capacity to see the showcase. Obviously, at first guest identification was not accessible, but rather by and by that was the main distinction. As cellular telephones began to wind up more propelled, it obliged more push to make cell telephones open to visually impaired individuals. Telephone producers began to incorporate voice acknowledgment with their still basic

telephones. While access was altogether different for visually impaired and located individuals, in any event it was conceivable to utilize the telephone directory, check telephone status, and so forth, regardless of the fact that the achievable usefulness was constrained. The visually challenged people face a lot of challenges in life. Smart phones (Touch Screen Mobiles) is almost next to impossible to operate because the input is given by touching the screen and thus visually challenged people who have some color blindness or who are fully blind cannot do so. Once the application is started everything will be based on their voice commands. For Ex. If a person says, "Message Raj, I will be late today." here everything will be translated into text and the application will ask for confirmation i.e. whether you wish to send this message to Raj? There will be pre-defined commands like "Message", "Call", "Email", "Close", "Open" Etc. The users can set some voice commands according to their convenience.

## 1.1 Problems Faced By Visually Impaired

### 1.1.1 Basic Problems

Blindness can be seen during childbirth, obtained through ailment or mischance, or connected with maturing (glaucoma, waterfalls, macular degeneration, optic nerve decay, diabetic retinopathy). Visual impairment speaks to a continuum, from extremely poor vision, to individuals who can see light however no shapes, to individuals who have no view of light by any means. In any case, for general talk it is valuable to think about this populace as speaking to two general gatherings: those with low vision and the individuals who are lawfully visually impaired.

## 1.2 APPLICATIONS

While sci-fi style movements like bionic eyes that restore human vision may be getting closer to reality, general contraptions like mobile phones can even now act genuine obstructions to the outwardly weakened and ostensibly thwarted. Cellular telephones are inconceivable gadgets for opening up advantage, giving security, and overhauling lives with better correspondence. Deplorably various cell

telephones show to a great degree difficult to use for those with important visual incapacity or absence of sight. For these individuals, most touch screen phones make course and keypad operation hard to unimaginable and even those phones with a better than average keypad as often as possible have menus and course that require the ability to scrutinize little or not well characterized content.

## **2. LITERATURE REVIEW**

There are a few things that are simply difficult to comprehend on the off chance that you don't have any kind of exposure to them. One of those few things that (particularly sighted) individuals experience serious difficulties is how visually impaired individuals use smartphone gadgets with only a level screen and one to possibly four physical catches was the worst thing about numerous visually impaired clients when it first turned out, however we all realize that things have changed in the last couple of years, and telephone have turned out to be truly available. Be that as it may, what does that mean (particularly to located clients who are not as a matter of course acquainted with accessibility). How does openness blind clients? What do they do distinctive with their telephones to do what located clients would do? What sort of uses do they use on their telephones? Up to this point, most touch screens gave few or no openness components, abandoning them generally unusable by visually impaired individuals. Notwithstanding, dazzle group and innovation producers have gained ground in the late years. Illustration: Google and application discharged screen perusing programming for their touch screen based cell phones. As of late, scientists have investigated open cooperation systems for portable touch screens, and business makers have started to fuse screen-perusing programming into their cell phones [1] (e.g., VoiceOver, Eyes-Free Shell2, and Mobile Speak for Windows Mobile). Getting suggestions from colleagues and visiting NGO's for especially blind people, we thought of creating android application for visually impaired people. This people who also want to use android smart phones face a lot challenge using touch phones. Visiting NGO's and asking the blinds was the main reason for developing application for them. The idea behind the application was built keeping in mind real time problem with the visually challenged people. Android provides Talkback facility which is under the accessibility function in the settings of any android cell phone. Thus when talkback is enabled then there will be a speaker who will speak anything which is being displayed on the screen. This is used so far by the blind people who want to use Smartphone, but still they face problems when they want to call any person or message a particular person from their contacts.

Here TTS Text-To-Speech is used which converts Text to Speech. Text-to-speech API is available on android developers webpage which can be used and can be more expanded in the way we want.

With the change [2] of advanced cells today, the business is impacting with distinctive flexible application. These advanced cells offer the people by giving straightforward assistance with accessing to information and giving various crucial functionalities to them. The found people can use such PDAs adequately however as a result of the frailty to scrutinize information on the screens, outwardly weakened people face enormous inconveniences in using the propelled cellular telephones. Despite creating thoughtfulness regarding the openness issues for outwardly hindered people, fashioners still face challenges when making open interfaces. One imperative obstacle is a nonattendance of seeing about how

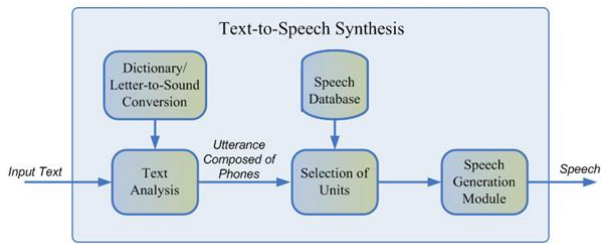
they truly use touch screens. Various studies have been coordinated to take a gander at how outwardly hindered people and found people use touch screen signals. In this paper we propose "New Vision", an application to make calling and illuminating less perplexing for the ostensibly tried. Using NEW VISION, calls and messages can be made to pre spared contacts using illustration affirmation and the position of customer can be recouped using Global Positioning System development. Additionally, we show a substance to-talk interface and yield through Vibrations to encourage the utilization of PDAs for the outwardly disabled customer. Using the distinctive functionalities of any crucial cell phone like calling, illuminating, knowing the time, battery level thus on are made basic for the apparently tried customer. Despite the fact that [3] cell phones incorporate availability highlights accessible for outwardly weakened clients, the client interface of most of the portable applications is intended for located individuals. It is clear that "Plan for Usability" contrasts depending if the last client is a located client or an outwardly hindered client. This paper presents the idea of "Low Vision Mobile Application Portal", which gives an approach to get to versatile applications particularly intended for outwardly weakened clients. Some configuration perspectives will be portrayed.

### **2.1 Common Challenges**

As soon as cell phones begun to emerge out there, his or her convenience ended up being less difficult. Impaired people nearly were required to memorize the actual structure of the phone's keypad, which is very like typical phones, nearly using two more desired important factors, send in addition to cancel. After studying most of these important factors, it had been possible to utilize almost all of the phone's operation, even with no to be able to understand the present. Of course, initially mystery caller username wasn't obtainable, in process that has been the only variation. Since cell phones begun to be sophisticated, that essential a lot more energy to make cell phones available to be able to sightless people. Mobile phone manufacturers begun to develop style acceptance within their nevertheless basic phones. Even though access ended up being different for sightless in addition to sighted people, at the least it had been possible to utilize the unit guide, check out cellular phone rank, etc. even when the actual possible operation ended up being limited.

## **3. AWAAZ DESIGN**

The application consists of different functionalities which are not yet available in the smart phones for the blind. The different application like Calculator, Browser, Call Screen, etc. would be designed separately by keeping their needs in mind. The Text To Speech service provided by Google will be used and also to provide the users an Indian touch, the commands and instructions will be given in Hindi [4] which will be recorded by us. The speech technology is in fact built in two parts. The first is a speech synthesizer (often referred to as Text to Speech or TTS in short) that the device or application can use to communicate with user –for example, read text on demand or keep users informed about the status of a process. The second is a speech-recognition technology that allows users to talk to the application to send commands to it or a message/email dictation what we usually do with a keypad. An ideal voice application should include both. Also we have set the application as a launcher. Here, the major advantage for the visually challenged people is to open the application AWAAZ simply by keeping the launcher as the home screen.



**Fig 1: Core System Architecture**

### 3.1 Features

Key highlights and features are:

A voice based command android application

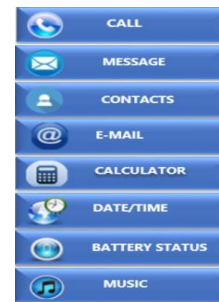
- Voice Dialing: A voice-initiated mobile phone grants you to dial a number by talking the name of a person into the phone. When you talk the person's name, the number is dialed for you consequently
- Audio alert or announcement of signal strength or connection status
- Distinct audible indication of battery status; e.g., low battery, 50% charge, or full charge
- Spoken menus
- A non-visual way to tell whether your phone is on or off
- The client can first introduce a specific programming on his mobile camera phone. At that point the client can take a photo of the bill and let the software talk its denomination.
- Keeping in mind all the difficulties and the challenges that are faced by the blind people and by the people with low eyesight in their everyday life the particular application or the software is been developed.
- The application will provide the people various functions through their phones that will help them to do their daily activities and task.
- The people i.e the blind people and people with low eyesight will just have to operate their phones through their voice.
- The voice commands will be received by the software and then it will be processed according to the task requirement of the particular user and then it will be given to the user through voice command.

People will have to use their imagination less to do the tasks which they do through their hand. The possibility of any error or bugs while communicating with the user with their phones is very much less. People will be able to operate their whole mobile phones upto the mark. People will be able to accept, reject and call any person. People can set alarms and can use calculator. Some of the features are: VoiceOver, Voice Control, White on Black, Zoom, Speak auto-text, tactile buttons, giant fonts, hands-free speakerphone, audible, visible and vibrating alerts or assignable ringtones.

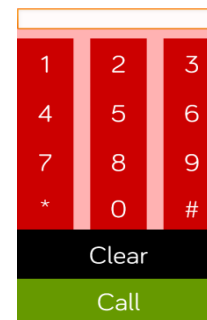
### 4. IMPLEMENTATION

The main objective in designing and implementing the GUI of the project is that the blind people should feel comfortable using smart phones, because they have loss of eye sight there

are big buttons, so if anywhere they click it will work. Small buttons are difficult for them to find hence there is just one big button which can be operated by clicking anywhere on the screen with proper voice guidance and speech support.



**Fig 2: Voice and Speech support based interactive menu screen**



**Fig 3: AWAAZ voice and speech support based calculator with basic functionalities**



**Fig 4: SMS feature where user can send SMS to a number through voice commands and get response as an acknowledgment through voice**



**Fig 5: Current battery status voice based announcement**

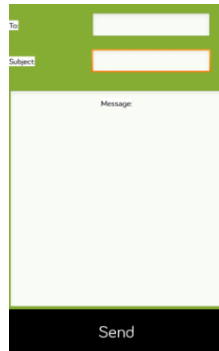


Fig 6: Automated email sending feature similar to the SMS provision

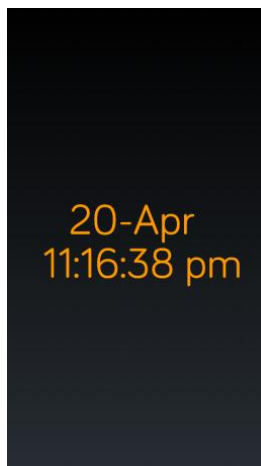


Fig 7: Current date and time status voice based announcement



Fig 8: Phone profile selection (General, Silent or Vibration) through voice command

This entire system was developed using Eclipse [5] tool which is an open source JAVA [6] development tool that allows to develop android mobile based application and provides the necessary support files and libraries.

## 4.1 Modular Description

### 4.1.1 Calculator

- The calculator speaks out commands.
- It is Localized to: English

- The Calculator that is made has a well-disposed genuine implicit voice that peruses out figuring inquiries and answers.
- The Calculator is talking. After clicking '=' the result will be read out by the calculator.
- You can pick precisely what you need to be talked, for example, pressing any number, or exactly when pressing the "equals" button
- The interface is intended to be extremely straightforward and easy to use.

### 4.1.2 Music Player

- A simple, eyes-free music player for Android!
- All controls are based on the hand gestures.
- The music player lists the songs in a scroll fashion.
- As the user scrolls down the list, the song names are read out which can then be played by tapping twice on the choice of the user

### 4.1.3 Contacts

- The contacts menu reads out the address book's individual entries.

### 4.1.4 Call

- Number pad is used.
- Call can be made on clicking the numbers with the help of talkback accessibility.

### 4.1.5 Message

- Text messaging works in a way, with a detailed audio description for contacting someone.
- This also applies to receiving and sending messages.
- Dictating a text message is done through Google's voice recognition feature, with messages being read back before being sent.

### 4.1.6 Email

- Text messaging works in a way, with a detailed audio description for contacting someone.
- This also applies to receiving and sending messages.
- Dictating a text message is done through Google's voice recognition, with messages being read back before being sent.

### 4.1.7 Battery Status

- App that announces battery events:-
- Level and Charging when you connect your charger
  - Battery Full
  - Battery Low
  - Battery level in percentage
- Announcements are made with female voice in US English, using the Google TTS engine.

### 4.1.8 Current Time and Date

- Says current time.
- You don't have to check time on your phone every five minutes, now it will tell you what time it is.
- Says the current date in dd:mmm:yyyy fashion.

### 4.1.9 Phone Profiles

- It helps users to adjust the phone's profile which consists of 3 options.

## 4.2 Application Outcomes

### 4.2.1 Set the app as a launcher

- Open the app by double tapping without Press Power or Home Button
- The launcher size is set as one complete button.

### 4.2.2 Read out the name of the person calling

- The app speaks out the Incoming caller name and SMS sender name so that you can identify who is calling without looking into your phone. It can even read the SMS content for you.
- It uses the built-in Android text-to-speech engine to voice the caller or SMS Sender ID.

### 4.2.3 Accept/Reject Calls

- You can also talk to your phone "Hello" to accept, "Stop" for reject and "Silent" for silent mode.

### 4.2.4 Call someone/Message someone

- Speak a contact to make a call, send a message, send an email or view contact information.
- Talk with your friends without searching them in the contacts list, but find them with your voice.

### 4.2.5 Read out Email, Read out messages

- It reads aloud the text displayed .e.g long emails, text messages.
- Use phone with commands like up, down, select the text, etc.

### 4.2.6 Use calculator

- A Calculator with speech input and output
  - Easy to use:
  - Start the app
  - Speak into the mic
  - Input (for checking) and result is shown
  - if you click on the result text, it is spoken to you

### 4.2.7 Access Internet(Work In Progress)

- Read out the data on the internet pages(done so far)

### 4.2.8 Alarm

- This lets you interact with your phone using your voice:
- Talk to it with custom commands to stop the alarm or activate the snooze option.
  - Listen to your phone telling you about the weather, news of your choice.

### 4.2.9 Battery status

- It has voice notification capability to notify 'Full Charge' and 'Low Battery' status.

## 5. RESULTS

After developing and testing the initial application, a survey was carried out for 107 visually impaired volunteers to test the feasibility of the application.

Table 1. Awaaz Android Application Feedback

No. of visually impaired volunteers	Not Understood (Requirements for demonstration)	Needs Improvements	Average	Good
107	7	8	44	48

## 5.1 Methods Implemented

- android.name="android.intent.category.DEFAULT" : Used to run the application as a launcher in the android device. Launcher is an interface that the android device provides which consists of applications and widgets. Awaaz is a launcher application so that the visually challenged people don't find difficulties in using the application and find all the functions needed at one place.
- OnClickListener: This is an interface used to implement on clicked events for buttons and other UI elements. This implements methods like OnClick.
- startActivity(): This is used to start intents in Android. The brackets contain the name of the Intent variable which related to the class to be started.
- RecognizerIntent.ACTION\_RECOGNIZE\_SPEECH: This method checks for the presence of Text To Speech Engine in the device. If not present it gives an error message saying that the TTS Engine is not initialized.
- onActivityResult: This method contains the section which performs the output action when the TTS Engine is detected and the user speaks a word.
- getPackageManager(): This method is used to fetch the default packages installed by the Android Device like calculator, clock, camera, etc.
- OnGesturePerformedListener: This is a listener class that is inherited to recognize Gestures.
- onGesturePerformed: This method checks the prediction score of the gestures.

## 6. CONCLUSION AND FUTURE WORK

The conclusion can be made that the application is of a great use for the visually impaired people and the blind people. The blind and the visually impaired people will be able to use the application and access their smart phones to a greater extent. They will be able to use almost each and every application and functions of the smart phone. The application will help in making the life of the blind people easy. The blind and the visually impaired people can live their own life independently and comfortably without depending on others for their work. The idea behind the application was built keeping in mind real time problem with the visually challenged people. This application will cover all basic things which a normal man does using his smart phone. Thus we have a great pleasure making an application which will benefit the Blinds more than the ordinary people.

The application that we are designing is based on the voice of the person. We can handle the applications through our voice and gestures. The application is executed on the Android operating system 2.3 Gingerbread and all the versions of

operating system launched after the version 2.3. The application that we are designing can read out the text messages and the senders name and also write the message that we want to send. So, in the future we can design the application that will be able to read all the options and the various functionalities of the messaging function. We will be able to save the messages, draft them and also can browse through the various options through voice.

Then, there is the email that we can access via voice. In the email the application helps us to read out the mails and also write the emails. In the future we can design the application to also read the draft and saved messages and it can access various function of the email and also differentiate between mail ids. The application also helps in the calculator and its functions like addition, subtraction, multiplication and division. In the future we will be able to design the application that will be able to support the scientific and the loan calculator also having the large and complex values and functions. There can be betterment in the calling facilities of the application. In the calling functions we can also include the voice call and the voice message. We can also use the application for the games which requires logic and reasoning. We will be able to use our application for the various different applications and the functions that will be introduced in the further versions of the android operating system. The application will be compatible with the later versions of the operating system. Also after improving more surveys will be carried out to make the system more improved for the visually impaired.

## 7. ACKNOWLEDGEMENTS

We would like to thank Mr. Ram Agarwal, President of Indian Association for the Visually Handicapped (IAVH) for providing us with a learning opportunity to work with them. Their guidance and support was a constant source of inspiration. They kept faith in us and gave guidance on how to go through the various aspects in the project. We are very thankful to them for giving us the kind opportunity to work with their Organization and are also highly obliged to them for allocating us very interesting and challenging tasks. The whole staff of the IAVH NGO was highly co-operative and we are thankful for the support they extended to us.

This work is kept open source and is aimed towards the betterment of the visually impaired; if other developers wish to carry further improvements and development in this application then the source files are hosted at: <https://github.com/deepenpanchal/Deepen.git>

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