An Application of Voice Mail: Email Services for the Visually Challenged Individual

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Abstract

Communication plays a crucial role in every field in one's life. It is an integration of the communicating technologies with the help of internet. But this facility is not for blind people. Hence, we aimed to develop an Android based email application that can facilitate visually challenged people to use email services for communication. The application will work solely on voice commands spoken by the user which will enable them to communicate with the world. They can send and receive any mails whether it is a text document, picture, audio, video, etc. using this system using the internet. By providing the platform in which they can speak the operation and can able to send and receive the messages. The system will be build using Google Text-to-Speech and Speech-to-Text APIs, which will make it efficient, accurate to a certain limit and user friendly.

Keywords: IVR, STT, TTS, VA, AVR, VR, SMTP, IMAP, POP3.

INTRODUCTION & BACKGROUND

Internet is a network of networks that consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies.

The traditional ways of communication including telephone, radio, television, paper mail and newspapers. These media

have been reshaped, redefined, or even bypassed by the Internet and have given birth to new services such as email, internet telephony, and internet television. In order to access the Internet, a person must know what all is appearing on the screen. If a person is unable to know what is appearing on the screen, then this technology is of no use to him. According to a survey, there are around 250 million visually impaired people across the globe. This clearly suggests that such a large number of people are unable to use Internet or E-mail.

Electronic Mail or simply Email is defined as a way of exchanging information among people using electronic devices such as computer, mobile phone, tablet etc. Despite of the fact that it is the most reliable and the most efficient way to communicate over the internet, not everyone is capable to use it. There are some visually challenged people among us, who are not able to see and thus cannot have access to the computer screen or keyboard.

There can be two ways by which a visually impaired person can access the email facility. Either the person has to dictate the entire content to be written in the mail to another person who could type the mail and send it on his behalf, or the person needs to remember the position of all the keys on a keyboard so that he could type the mails himself. Also he also needs to remember the keyboard shortcuts to switch between different options and fields in an email system. It can be clearly understood that it is very less likely that every time a visually challenged person can find someone for help.

Hence, we have come up with this project. This project is an effort to provide a solution to this problem and enables the visually impaired people to access the email facility through their voice.

RELATED PREVIOUS WORK
History
There are a large number of email users. The email systems that we typically use cannot be used by visually challenged people. This is due to the reason that these services do not provide any facility so that the user can hear out the content of the screen.

There are many screen readers available in some of the existing systems. Despite of this, these systems are not very efficient and beneficial. This is because screen readers read out the content present on the screen and guide the user to perform

certain actions to achieve respective outputs. To perform these actions, the user needs to use keyboard shortcuts and ultimately for that, the user needs to know the position of different keys on the keyboard. Also, as mouse pointer location cannot be traced by the screen readers as well as the user, these systems are not sufficient.

Drawbacks of Existing Systems: Use of screen readers makes it difficult for blind person to access E-mail system as screen readers cannot trace the location of mouse pointer.

Existing systems require basic information about keyboard shortcuts and where the keys on a keyboard are located. So, these systems are not of very much use for blind and handicapped people [2]. Nowadays, mobile is a very common word. It is known to almost all people. Moreover, tools and technologies mentioned above for the blind users are still unavailable for mobile devices [5].

One of the research papers described a mobile phone application that could understand and read out the information coded in the form of barcode on a package. This can be achieved using the phone camera. As soon as the barcode is detected

by the camera, the user will be prompted through speech output to bring the camera closer to the barcode until it can be clearly resolved by the camera. The system then analyzes the barcode and the corresponding product information is provided to the user through voice output.

The drawback in systems using screen readers is that the screen readers read the content in a sequential manner and can only understand the content written in basic HTML. Therefore, the user will be able to know the contents of the screen only if they are written in basic HTML. The web pages these days are not written in basic HTML. Rather, they are written in CSS, Bootstrap, JavaScript and many other languages. This is done to make the websites more attractive and user-friendly. Thus, screen readers are unable to understand and read those [8].

This system will work on the voice commands and prompts for confirmation of actions. The system will ask the user to perform specific actions in order to achieve respective goals.

Existing Systems
The conventional mail service is useful only to the people who can see and type as well. HTML and CSS designed web-based

emails are not created while keeping accessibility for all, in mind. The existing mail services do not provide easy access to the visually challenged people because they are in written format or any type of attached information and there is no read out option to hear the mail that is received to their mail addresses. Although we have screen readers that enable these people to access the desktop applications, we do not have any technology or system that can help these people to access the web applications.

The only purpose of using the emails is to communication. But the existing system of mail service fails in providing the user friendliness to the people. This suggests that there are lots of disadvantages of using these types of systems. Hence, the limitations are listed below:

- The visually challenged cannot use the normal mail system.

- Due to unavailability of completely voice based applications, such people are unable interact with the web based applications.

Also there are systems which use barcode readers to scan the messages and then read them out. But these systems are not of much use as barcode scanning is also a big task for people having visually impairment [5].

One of the researches led to the development of an application that could help the user to send and receive mails in English language. It was found that the proposed architecture performed better than the existing architecture at the time of this research. In that project, speech-to-text and text-to-speech conversion techniques were applied for providing easy access to blind people [10].

PROPOSED SYSTEM

The system that we are proposing is based on a completely innovative idea and is nowhere like the existing emails systems. Any technology can be considered beneficial if it can be accessed by all types of people. The existing mail systems do not provide any such facilities by which a visually impaired person can have access to them.

Thus, the system that we are developing is entirely different from the existing ones. Unlike other systems which focus only on a particular set of people, our system is focused on visually challenged people too.

This will be an Android application that will be completely based on "voice" or "speech". The user will be able to give commands to the system, which, the system will follow. Moreover, the system will prompt the user to perform specific actions to avail respective services. The application will be accessible on all Android based devices and will be voice controlled.

The major advantage of this application is that it will not require any input through keyboard. The only thing that the user will need to do is to touch the screen for enabling the device to start taking voice input. Now the question arises that where exactly the user will need to tap on the screen and how the blind person will locate the target point. As any particular point cannot be spotted by a blind user, the system has given the user a freedom to tap anywhere on the screen and speak out his inputs.

The point where the user is tapping will not affect the input and other operations performed by the system. Only one input field will be active at a particular instant of time. Due to this, the input will be feed into the correct input field irrespective of the position where the user has tapped on the screen.

DESIGN

User Interface Design - Android provides a variety of pre-built UI components such as structured layout objects and UI controls. This allows the developers to easily build the graphical user interface for their applications. In addition to this, Android also provides other UI modules for special interfaces such as dialogs, notifications, and menus. The user interface of our application is designed using Android XML.

Database Design - Our application uses the database of Google for storing user details and emails. The user needs to use the application using his Gmail account.

System Design - The Data Flow diagram given below depicts the detailed flow of events in the system. All the operations are performed by voice commands and voice inputs only.
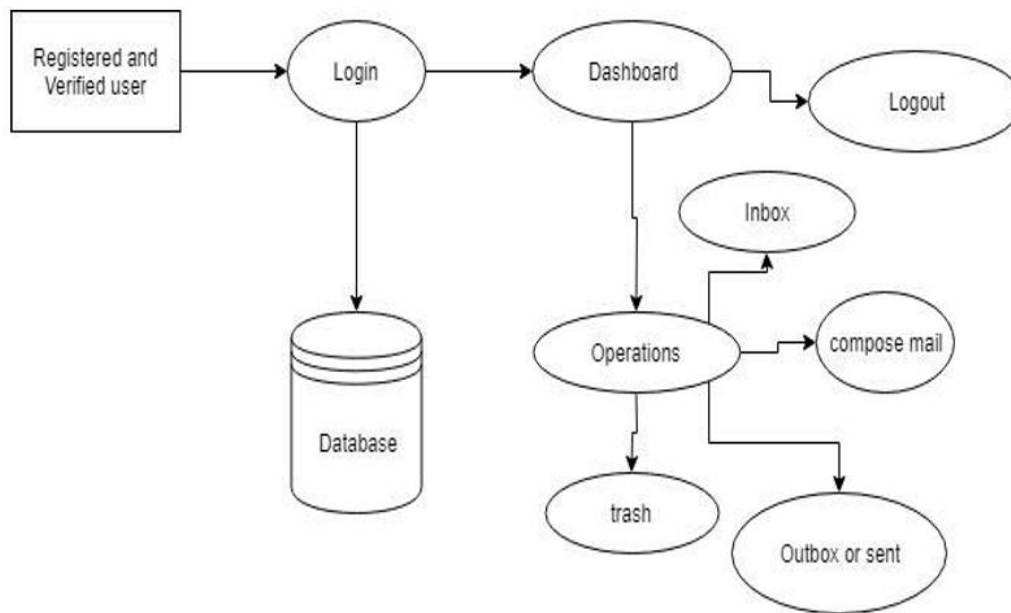
Figure:-1

IMPLEMENTATION

Registration - This is the first module of our application. Anyone who wishes to use the application must either have a Gmail account or he will require creating one. He can then use our application using his Gmail account.

Login - In this module, the user will have to login through his Gmail account. When the user installs and opens up the application for the first time, he will be provided the list of google accounts existing on his device. He will be logged in to the account which he selects.

Dashboard - After logging in, the user will be directed to the dashboard containing options for: Inbox, Compose new mail,

Sent mail, User info. The user will speak out "inbox", "sent mails", "compose", "user info" and the respective action will be performed.

Compose Mail - This option is used to compose new email. This option will not work same as that of the existing systems. Rather it will take voice input. The user will just have to give the input through his voice. No keyboard shortcuts or typed input will be required. The user will be prompted by the system to tap anywhere on the screen and speak out the recipient's mail address, subject and body of the mail. After entering all the content, the system will read out the content so that the user can check whether it is correct or not. In case of any correction, the user can re-

enter the content. After taking all the required inputs, the system will prompt the user to speak "yes" to confirm and send the mail. After receiving the required response, the system will again prompt the user about the successful delivery of the mail.

Inbox - When the user speaks "Inbox", this screen will be displayed. The system will prompt the user about all the new mails received and read out the sender's name one by one. The user will then speak out the name of the sender whose mail he wants to be read out first. The system will then read out the sender's name, subject and content of that mail.

Sent Mails - This section maintains a record of the emails sent by a particular user. In case the user wants to access the emails that he has sent so far, he will be able to do so by choosing the "Sent Mails" option available on the dashboard.

User Info - This option will contain the username and email id of the user.

A flow chart illustrating the work flow of the system is given below:
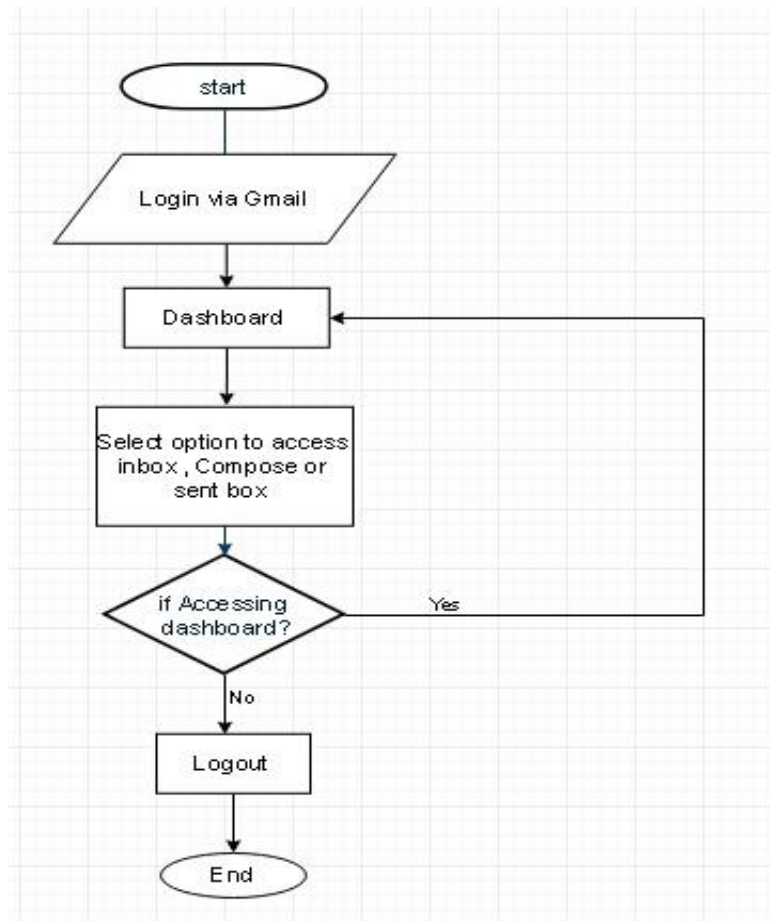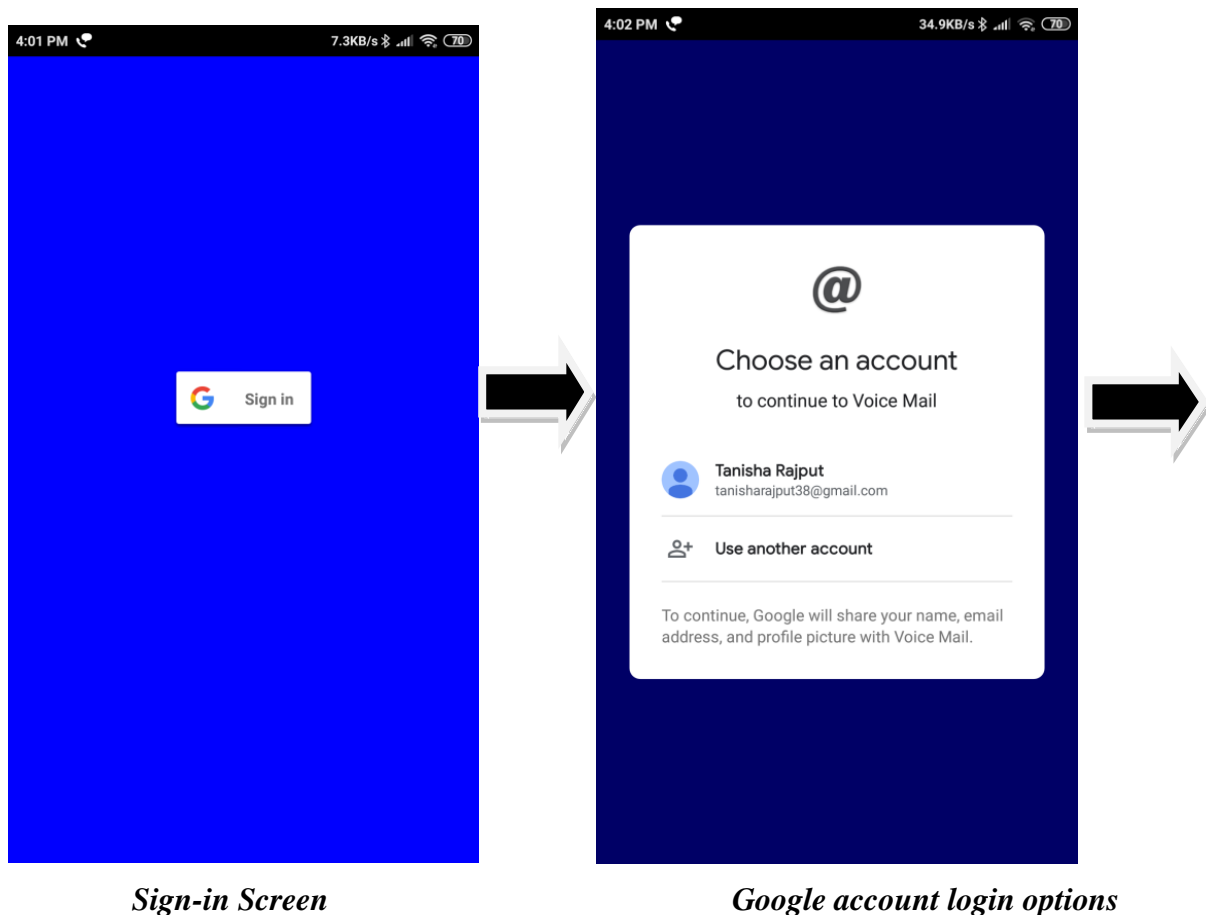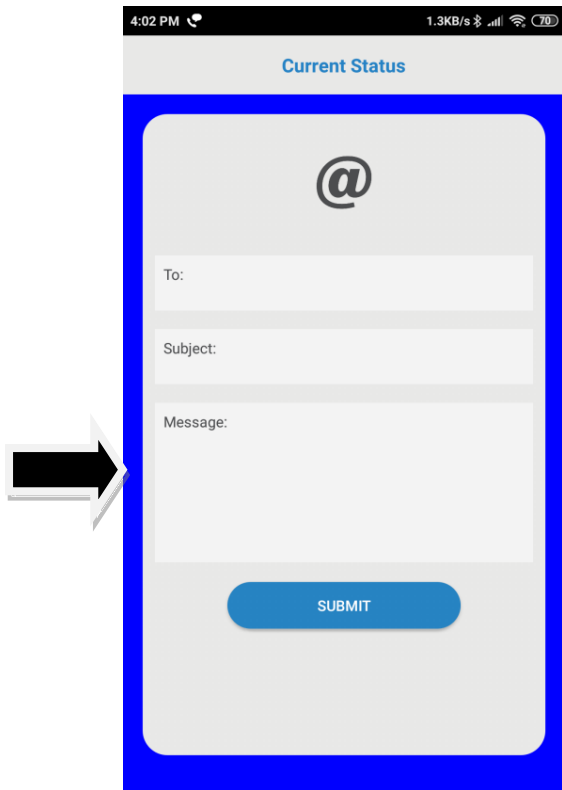
Technologies Used

- Programming language: Java

- Firebase

- GIT

- Protocols: SMTP, IMAP, POP.
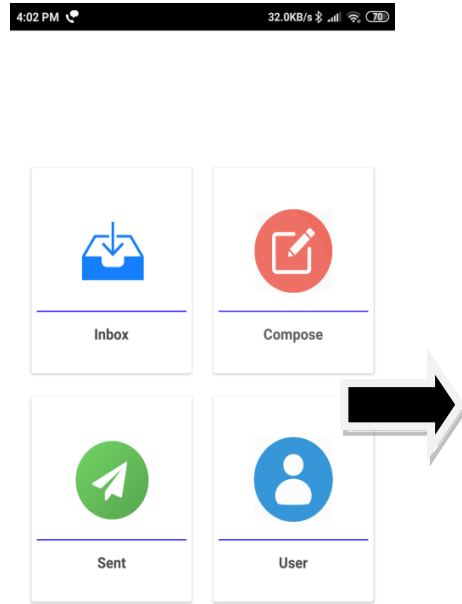
- APIs used: Google Text-to-Speech and Speech-to-text.

RESULTS

Implemented Application Screenshots: The implementation of project helps us to produce the desired results as follows:
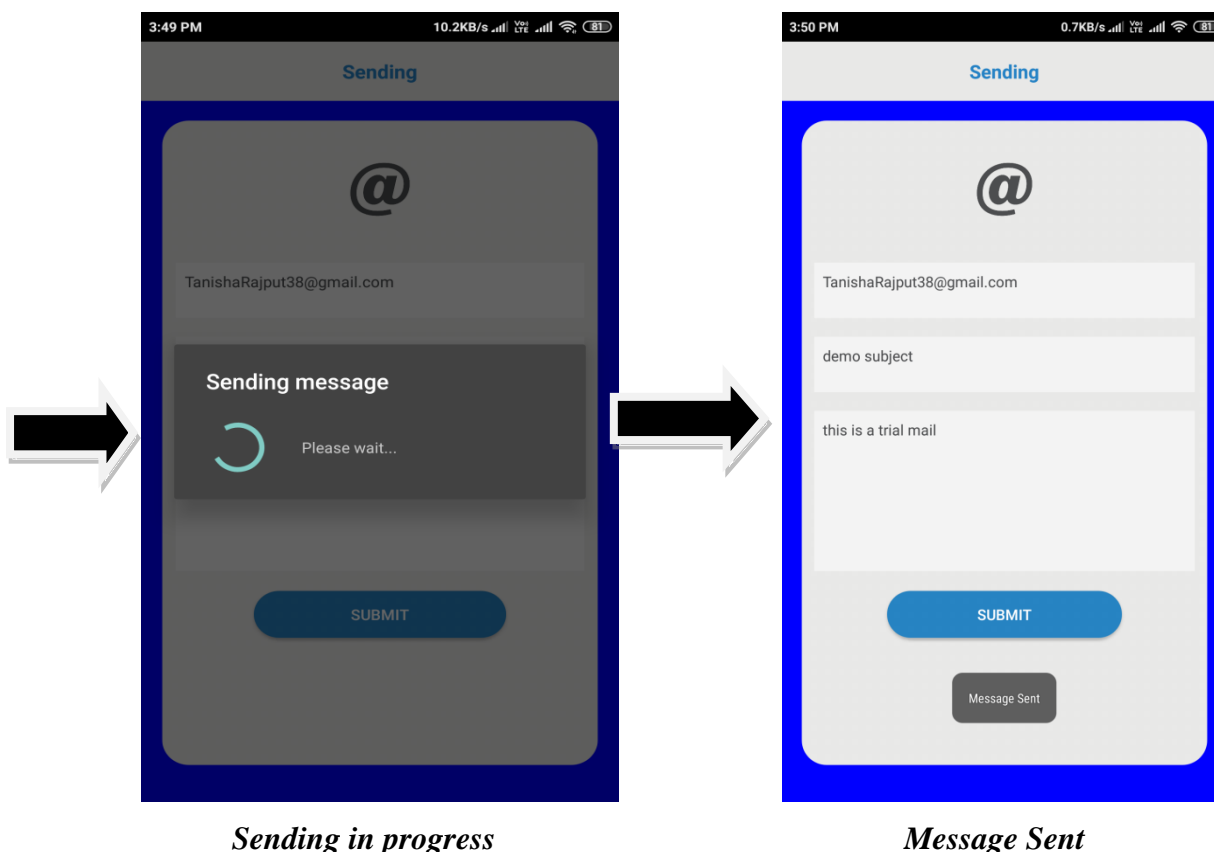

Sign-in Screen

Google account login options

Dashboard

Compose Screen

Taking Voice Input

Email content entered

Sending in progress   *Message Sent*

NOVELTY IN OUR WORK

This application is much secured and efficient which allow them to access the application by using conversions of Speech-to-Text (STT) and Text-to-Speech (TTS) will help them to listen and respond on their emails. This technique helps them to facilitate the operations of email very easily with the help of Automatic Speech conversion (AVR).

Hence, the system is self sufficient in helping the visually impaired people in providing the interface with the email system. It involves the authentication of the user in which it ensures the details of the user with the speech recognition phenomenon. And also provide the method of checking the sending message in the compose section. It always confirms you for the operation to be performed. This type of application will use SMTP, IMAP and POP for connection at the server and client end to send and receive the mails.

FUTURE-SCOPE, LIMITATIONS AND APPLICATIONS

- This application can be easily used by the users of any age group.

- The system has implemented Google Speech-to-Text and Text-to-Speech

APIs. This makes the system convenient for use by visually impaired people.

- The people having typing problems can also take advantage of this system.

APPLICATIONS

- This Android application can be easily and efficiently used by the visually challenged people.

- The individuals having typing problems can also take advantage of this system.

LIMITATIONS

- This system will not work if the user is unable to speak out the content.

- The application will work only for Google accounts.

- Biometric verification is not yet implemented. Hence, security and privacy can be at stake when the user speaks out his credentials and message content.

CONCLUSION

Our application is user friendly, efficient and an economical system, which allows a visually challenged individual to interact with an Android application easily. It involves the development and implementation of a real-time email interaction system for visually impaired. We have planned to develop a system that could facilitate the visually challenged individuals to access email services in an efficient way. Our application can help in overcoming some of the drawbacks of the existing email systems. In this system, the use of keyboard has been eliminated completely and thus reduces the cognitive load of remembering keyboard shortcuts as well as the position of the keys on a keyboard. The user only requires listening to the voice commands given by the system and respond accordingly in order to get the desired operations performed. This requires user to speak the operation in the email application and then the system will perform the required operations. The user would be requested to feed info through voice inputs whenever required and system will ensure the authentication of the user details.

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Voice Based Email System has been developed.

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