Design and Development of a Voice-Based Email System for Visually Impaired Users Using Speech Recognition

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Abstract— *In day-to-day life, internet has become one of the most important things. Every individual person is accessing the knowledge, information, and all the features for the communication via internet. The visually impaired persons face difficulties in accessing these features and require external assistance to make their work easier. The development of computers has given a new opportunity to the visually handicapped persons around the world. The audio-based environment and many other features have helped blind persons to avail the opportunity of the workspace. Now, if a person wants to send private information, it is possible only by means of email. Email is a type of technology that helps corporate communication and also allows a person to send mail to others. The major aim is to create a voice-based email for blind or visually impaired persons so that they can send and receive emails via computers. This will utilize the latest features to create an environment that is helpful for the visually challenged persons to work without any external assistance.*

Keywords— Voice-Based Email System, Speech Recognition, Text-to-Speech, Email Accessibility, Assistive Technology, Visually Impaired Users, Screen readers.

I. INTRODUCTION

In today's world, Internet is considered a storehouse. In fact, it is considered one of the standard methods of communication. In this, email is one. In all aspects of the business world, email has become one of the most common methods of communication. However, not all can use this email. In fact, until it is not visible, it is of no use. Visually impaired and illiterate people cannot use this technology.

Email is one of the most commonly used means of communication for us. But it is lacking for the visually impaired and illiterate population. The technology available today, such as screen readers, text-to-speech, and speech recognition, is not completely helping the blind access the internet. The world is home to 285 million visually impaired people, making it necessary for online communication for them as well. Therefore, it is necessary for the development of a voice-based email system which will help the visually impaired people who are naive about the system use the email facility with ease. All the operations of the system are based on simple operations, making it very easy for any type of user to use this system.

Also, there is no need for the user to worry about what operation he/she has to perform so that he/she can avail himself/herself of the particular service, as the system itself will prompt the user about what click will provide him/her with what operation. The navigation system uses TTS (Text-to-Speech) for Blindness in order to offer the service of navigation through voice. The Suggested System, as an independent program, is relatively cheaper, and it is possible to install it on smartphone carried by blind people.

A voice-based emailing system that can help visually impaired and illiterate people use common technology for sending and receiving emails and using the internet. With the help of this method, blind people can easily log in to their email account using voice commands. The primary objective of developing a voice-based emailing system is to foster a sense of community among blind people. Anyone can easily use our email system regardless of their age.

II. LITERATURE REVIEW

In the last few years, the rapid development of speech recognition and assistive technologies has led to the development of new and efficient communication systems for visually impaired users. Researchers have been trying to improve accessibility and incorporate speech-to-text and text-to-speech technologies, which allow visually impaired individuals to interact with computer systems using voice commands. Using speech-to-text and text-to-speech technologies, visually impaired individuals are able to perform functions such as writing, reading, and handling emails without having to depend on visual assistance. Along with voice interaction, the development of secure authentication systems and cloud-based email services has improved the reliability and accessibility of such systems for visually impaired individuals.

1.Divesh Jethani et al., (2018) [1] proposed a voice-based system for the visually blind with multi-lingual facility, the system provides a good GUI for all types of users. The user

will be able to send, receive, read, delete the mail from the mail system. But the main disadvantage includes the usage of mouse clicks, which is necessary at some places of the proposed application.

2. Dr. S. Brintha et al.,[2], proposed a system with TTS and STT to read and record symbolic linguistic representations like phonetic transcriptions. The architecture of the system includes two modules namely interface selection and mailing option, the first module selects the type of users that is blind user or sighted user. And the second module includes the simple mailing options to perform all tasks.

3. Parkhi Bhardwaj et al., (2016) [3], uses an extra- speech recognition technology along with all other -converters and IVR to develop the application. The proposed system provides more features than existing GUI. Java was the core programming language used.

4.Pranjal Ingle et al., (2016) [4] used three types of technologies to create the application namely STT (speechtotext) where the speech is converted to text, TTS(text-tospeech) to convert the text to speech, and thirdly IVR(interactive voice response) which describes the interaction between the user and the technology in many ways like keyboard or voice message. It also allows the user to interact with the mail system. The main disadvantage includes the usage of high sensitive mics which are mostly not available to all the users.

5. A. Kumar et al., (2018) [5] proposed a voice-based email system for visually impaired people that enables them to send/receive emails by simply speaking voice commands without requiring a keyboard or mouse. This system uses Speech to Text (STT) and Text to Speech (TTS) techniques to convert the voice commands into text or read the emails received by the user. The proposed architecture of the system includes voice commands, email sending, reading emails from the inbox, etc., allowing the visually impaired people to use the email system on their own.

III. OBJECTIVE

The primary objective of this article is to develop a voice-based emailing system that can help visually impaired and illiterate people use common technology for sending and receiving emails and using the internet. With the help of this method, blind people can easily log in to their email account using voice commands. The primary objective of developing a voice-based emailing system is to foster a sense of community among blind people. Anyone can easily use our email system regardless of their age. In the future, this technology can be improved and used for other purposes as well, such as sending texts and using voice commands for using other application.

IV. SYSTEM ARCHITECTURE

User Device Layer: The user device layer consists of the Client Application, which includes the Voice Interaction Interface and the Email Management Module. The Voice Interaction Interface is the source of the user-friendly environment that enables the visually impaired users to interact with the system using natural speech commands. The Voice Interaction Interface controls the components of the system that include speech-to-text functionality for the users' input, as well as text-to-speech functionality for reading emails. The Email Management Module controls the key functionality of the system, including composing emails, navigating the inbox, reading emails, and mailbox operations using voice commands. This layer of the system is responsible for ensuring that the users have an enjoyable experience with the system.

Backend Services Layer: The Backend Services Layer is responsible for providing the basic functionality for user authentication, email service, and voice processing operations. The Authentication Service is responsible for providing a secure login and verification mechanism for the user account by utilizing cloud-based authentication services such as Firebase Authentication or OAuth. The Email Service is responsible for providing a secure email composition, sending, and retrieval mechanism by interacting with email servers in a standard and secure manner, such as SMTP and IMAP protocols. The Voice Processing Service is responsible for providing a real-time speech-to-text and text-to-speech functionality by utilizing cloud-based voice processing APIs, providing accurate interpretation of voice commands and voice response for the user emails on all connected devices.

Data Storage Layer: This layer consists of information that is used for the smooth operation of the system and performance, stability and efficiency. for the continuous execution of user processes. This includes information such as user data, mail data, and voice data. This layer consists of a User Database, which contains information such as user profiles, mail server data, voice data, and accessibility data. The Mail Storage Module consists of data such as inbox data, sent data, and drafts. This data is stored by accessing mail servers or cloud services. This layer provides reliability and integrity for accessing information such as emails and voice data thus providing a better experience for user.

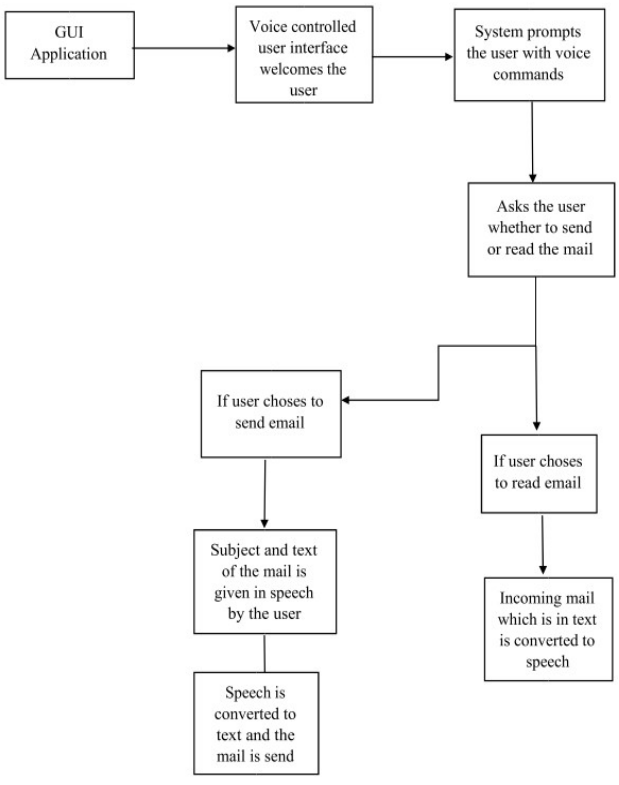

Fig. 1. *System Architecture*

V. RESULT AND DISCUSSION

Fig. 2. Starting page before login

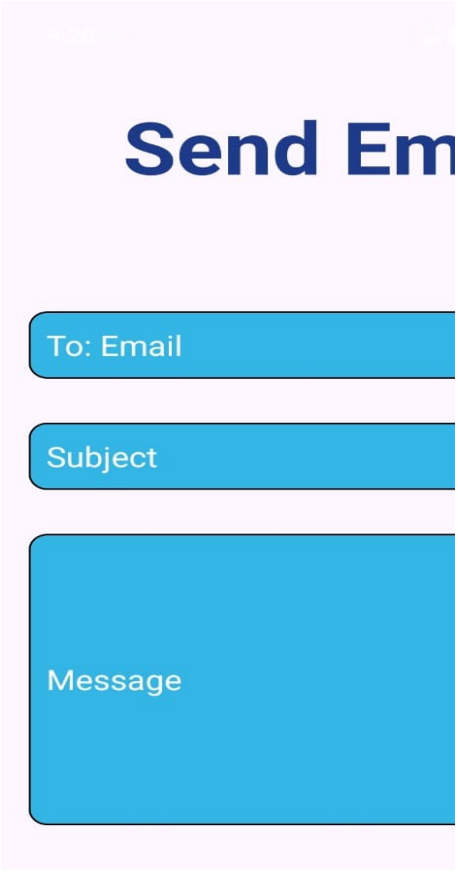

Fig 3. *Send Email page.*

The system also enables the user to completely control their messages through voice commands. The user is able to listen to their messages, reply to the messages instantly through voice commands, and also organize their messages into various folders or categories for easier navigation through the system. The user is also able to flag important messages, archive old messages, and even delete old messages through voice commands. The system also enables the user to read the summaries of the messages, the sender, and the time the message was sent, hence helping the user know the priority of the messages to reply to first. The system also enables the user to have shared mailboxes, hence helping various individuals within an organization or a group work together while keeping their individual mailboxes secure through audio confirmation of the actions taken.

As shown in Fig, The Send Email screen aims at offering the user an interface that is easy and friendly to use. At the top of the screen, the heading is clear, reading "Send Email." This ensures that the user knows the purpose of the screen. Below the heading, the screen presents the user with three input fields. These fields are for the email address of the recipient, the email's subject, and the message itself. Each of the input fields is designed with rounded corners, making the interface look friendly.

At the bottom of the screen, the user is presented with two buttons: the send button and the logout button. The send button sends the email to the recipient's email address, while the logout button enables the user to log out of the application.

As shown in the figure 2, the interface is also designed to support the use of voice commands. Therefore, the user can input the details into the input fields through the voice input system. This system uses the speech recognition feature to recognize the words the user utters. These words are then written in the input fields. For instance, the user can input the email address, the message, and the subject into the input fields using the voice input system.

CONCLUSION

The voice-based mail system aims at offering visually impaired users an uninterrupted, interactive, and fully accessible messaging service. By incorporating secure authentication, interactive handling of voice messages, and voice commands, the system enables users to effectively send, receive, and manage their messages. Such features as message management, audio feedback, and customization improve the user experience, communication efficiency, and the independence of visually impaired users in handling their mail.

In the future, the system can be enhanced with features such as AI-assisted voice message suggestions, smarter message prioritization, cloud-based mailbox access, and integration with other communication tools. These improvements would make the platform even more powerful, adaptable, and convenient for users, especially for collaborative or team-based communication. Overall, the project shows how modern technologies can create an efficient, accessible, and inclusive messaging platform, improving both daily communication and professional or academic interaction for visually impaired users.

REFERENCES

[1] Shruti Thakur, Aastha Tripathi, "VoiceMail for the Visually Impaired: A Voice-Based Mail System", (2025).

[2] Mohammad B. Khan, Chandrashekar Kushwaha, Ruchita Rani, Avni Verma, "Design and Development of Accessible Voice Messaging Systems for Blind Users", (2023) Programming (CrossCode)",(2023).

[3] Krishna Aher, Jagruti R. Mahajan, "Audio Mail: Real-Time Voice Messaging Platform for Visually Impaired", 2023.

[4] Samruddhi Sawant, "A Study on Accessible Communication Technologies for the Visually Impaired", (2023).

[5] Aditya Kurniawan, Christine Soesanto, Joe Erik Carla Wijaya, "Voice-Based Collaborative Messaging Systems", (2020).

[6] nwar Saif, Saeed Mohammed, Saleh Mohammed, Osama Ali, Majdi Abdu, "C-Voice: A Collaborative Voice Messaging Environment for Accessibility", (SJITN) Vol 8 No.2 (2020) (SJITN) Vol 8 No.2 (2020).