International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 05 | May - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Voice Activated Email System for Visually Impaired

Kanmani K N
Department of Computer Science and Engineering
Malnad College of Engineering, India
kanmanikn0505@gmail.com

Jeevitha S M Department of Computer Science and Engineering
Malnad College of Engineering, India
jeevithamahesh123@gmail.com

Karan Gowda K Department of Computer Science and Engineering
Malnad College of Engineering, India
gowdakaran24@gmail.com

Lakshan K S Department of Computer Science and Engineering
Malnad College of Engineering, India
kslakshan8@gmail.com

Dr. Uma B
Department of Computer Science and Engineering
Malnad College of Engineering, India
bu@mcehassan.ac.in

Abstract - In today's digital world, internet services like email are essential but often inaccessible to visually impaired individuals due to visually oriented designs. While screen readers exist, they can be complex and insufficient. This paper presents a voice-based email system designed to simplify email use for the visually impaired by allowing users to speak commands and listen to responses, eliminating the need for reading or typing. Using speech recognition and text-to-speech technology, the system offers a hands-free, eyes-free experience that enhances independence and ease of use. Testing showed it to be significantly more accessible and user-friendly than traditional interfaces, especially for users with little technical knowledge, highlighting the potential of voice technology to make online communication more inclusive.

Keywords: Voice-based Email, Voice Recognition, Speech-to-Text, Text-to-Speech, Visually Impaired.

I. INTRODUCTION

In the modern era of internet technology, communication has become significantly faster, with email being one of the most widely used applications. Email, short for electronic mail, allows the exchange of digital messages over the internet or other computer networks. Unlike earlier systems that required both sender and recipient to be online simultaneously, modern email operates on a store-and- forward model, where servers manage the transmission and storage of messages, allowing users to access them at any time. This advancement in communication, along with the overall ease provided by the internet, has transformed how people access and share information.

However, the visually impaired community faces major challenges in accessing internet services like email, which are designed primarily for sighted users. With over 240 million visually impaired individuals worldwide, many struggle to use email independently, often relying on others to send messages for them. This lack of autonomy not only limits their access to digital communication but also subjects them to societal criticism. The current norms of internet use— requiring sight—exclude a large portion of the population, making it clear that more inclusive solutions are needed to empower visually challenged individuals.

II. LITERATURE SURVEY

Voice Based System in Desktop and Mobile Devices for Blind People in IJETAE surveys existing voice-based assistive technologies for the visually impaired [1]. It focuses on speech recognition and voice feedback systems that help blind users interact with computers and mobile devices. The paper reviews limitations of screen readers and highlights the need for more intuitive, real-time voice interfaces, while noting challenges like language dependency and background noise.

Tackling the digital divide for the visually impaired, the paper Voice Based Search Engine and Web Page Reader in the International Journal of Computational Engineering Research (IJCER) reviews systems that enable users to search the web and hear webpage content through voice commands [2]. It discusses technologies like speech-to-text, text-to-speech, and basic natural language processing, while also highlighting challenges such as voice input accuracy, handling dynamic content, and multilingual support.

Empowering the blind to navigate the digital world hands-free, worked by International Journal of Advance Research, Ideas and Innovations in Technology introduces a voice-based system that helps visually impaired users access emails and multimedia on mobile devices using native language [3]. Using speech-to-text and text-to-speech, the system enables full voice interaction with over 90% accuracy, reducing the need for typing. Its user-friendly GUI improves accessibility and offers an advantage over traditional mail servers, especially in countries like India.

Recognizing the barriers faced by visually impaired and illiterate individuals in using internet services, the proposed Voice based e-mail System for Blinds offers a simplified voice-driven platform that eliminates the need for screen navigation or keyboard use [4].

It uses Speech-to-Text, Text-to-Speech, and IVR technologies to let users manage emails through voice and simple mouse actions, replacing complex interfaces with audio prompts for easier, more inclusive access.

Addressing the digital communication needs of visually impaired users, the paper Voice Based Email System for People with Visual Impairment by Rahul Kumar et al. presents a system that enables email management through voice commands [5]. It integrates speech-to-text and text-to-speech technologies, allowing users to send, receive, and read emails without needing sight. The system focuses on an intuitive interface and improving voice recognition accuracy, aiming to make email communication more accessible for visually impaired individuals.
In an effort to simplify email communication for individuals with accessibility challenges, the paper Voice Based Email System by Harivans Pratap Singh et al. presents a solution that enables users to interact with their emails through voice commands [6]. The system integrates speech-to-text and text-to-speech technologies, allowing users to compose, send, and read emails hands-free. The authors emphasize a user-friendly design that enhances accessibility, providing an intuitive interface for those with limited literacy or visual impairments.

Acknowledging the difficulties faced by blind and illiterate individuals in digital communication, the paper Speech Based E-mail System for Blind and Illiterate People by Saurabh Sawant et al. introduces a voice-operated email system [7]. By incorporating speech-to-text and text-to-speech technologies, the system allows users to manage emails through voice commands. The authors aim to provide a simple and accessible solution that empowers blind and illiterate users to interact with emails without the need for typing or screen navigation.

Incorporating artificial intelligence to revolutionize email communication, the paper Voice Based E-Mail System Using Artificial Intelligence by Khan et al. presents an innovative solution for voice-driven email management. By integrating AI with speech-to-text and text-to-speech technologies, the system allows users to interact with emails through voice commands [8]. The authors highlight how AI enhances voice recognition accuracy, even in noisy environments, while also improving language processing. This system aims to provide a seamless, accessible email experience, especially for those with visual impairments or limited literacy.

Limitations of the Surveyed Techniques

It is evident that mouse clicks are used for several activities in almost all the articles. It becomes more challenging for those who are blind. Additionally, because there are many languages spoken there that speech recognition software cannot grasp, the subcontinents of India do not benefit from this. English is the preferred language in its entirety.

Problem Statement

Create an application that empowers blind users to access and manage their email effortlessly.

III. METHODOLOGY

The development process begins with requirement gathering to understand the specific needs and challenges faced by visually impaired users when accessing email. User research methods like interviews and questionnaires help identify their preferences, ideal features, and common difficulties. Based on these insights, a user-friendly and accessible interface is designed, incorporating elements like high-contrast colors, large buttons, and intuitive navigation. The system also integrates a reliable speech recognition library, such as Cloud Voice-to-Text or Pocket Sphinx, to accurately convert spoken words into text, ensuring smooth voice interactions.

To further enhance accessibility, the application adheres to Android accessibility guidelines by including features like haptic feedback, gesture-based controls, and keyboard navigation. Integration with email protocols like IMAP and SMTP enables users to send, receive, and manage emails seamlessly. Strong security and privacy measures, including encryption and voice-based authentication, safeguard user data. The system undergoes rigorous usability testing with visually impaired users to identify and address any issues. Feedback from users and accessibility experts is used to refine the interface and improve the overall user experience.

A. Design Phases of the Proposed System

A. Phase-1:

The tasks that can be performed using the program developed will be prompted using the voice prompt. In background python module pyttsx3 is used for text to speech conversion. User will be asked to provide input for the following tasks written below. The input is expected in the form of speech by the user which will be converted to text by the Google speech application interface in python and accordingly tasks will be performed.

- Login to their Gmail account.
- Send e-mail through Gmail.
- Read e-mail through Gmail.

B. Phase-2:

In phase-2 of our program the user will give speech input to the system. This speech input will be handled by speech-recognition module. It is a python library which is used to handle the voice requests and it converts speech into text. Now after receiving input from the user speech to text converter will save the response in respective variables used in the script and based on their value it will further enter into respective modules.

C. Phase-3:

In this phase our program will handle the requests by the user. Based on the speech input given by the user it will launch the modules.

• **Login to G-mail account:** This module will handle the request by user to login in their g-mail account. This module will make the connection with the user's gmail account based on the credentials provided in input. This module's script designed as such it will prompt user which is already entered their g-mail username and password in the code.

• **Send E-mail through G-mail:** This module will handle the request by user to send email through their g-mail account. The python script for this module will prompt the user to enter their credentials and then it will make connection with their account. After the connection has been done it will further prompt the user to enter the receiver's account e- mail id and it will then allow the user to speak their message and it will repeat it for them and by saying ok it will send the mail. SMTP library in python is used for the above task.

• **Read E-mail through G-mail:** This module will handle the request by user to read email through their g-mail account. The python script for this module will prompt the user to enter their credentials and then it will make connection with their account. After the connection has been done it will start fetching the unread mails for the user and will speak it for them with the help of gTTS library in python for text to speech conversion.

B. System Architecture

The Voice-Based Email System for Visually Impaired Users features a voice-interactive design that enables users to navigate entirely through speech. Users log in using voice commands, with failed attempts prompting a retry. Upon successful login, a voice-controlled menu offers five main functions: Compose, Inbox, Sent Mails, Trash, and Logout. The system uses speech-to-text for input and text-to-speech for output, eliminating the need for keyboard or mouse interaction.

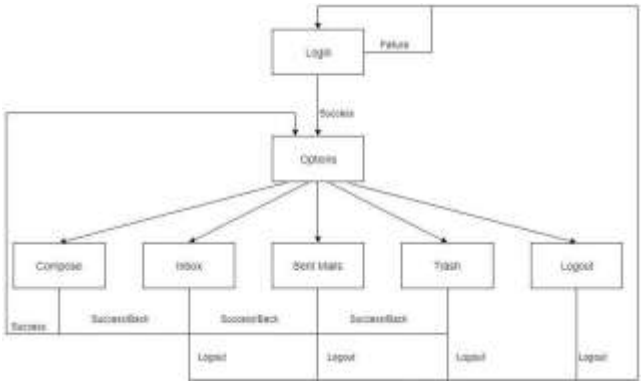

Figure: Block Diagram

C. Design

Options:

The flowchart illustrates the core logic of a Voice-Based Email System for the Blind, centered on voice-driven interactions. It starts by checking if the request method is 'POST', indicating a voice command submission. If not, the system displays an options page with voice-guided instructions for the users to navigate via speech.

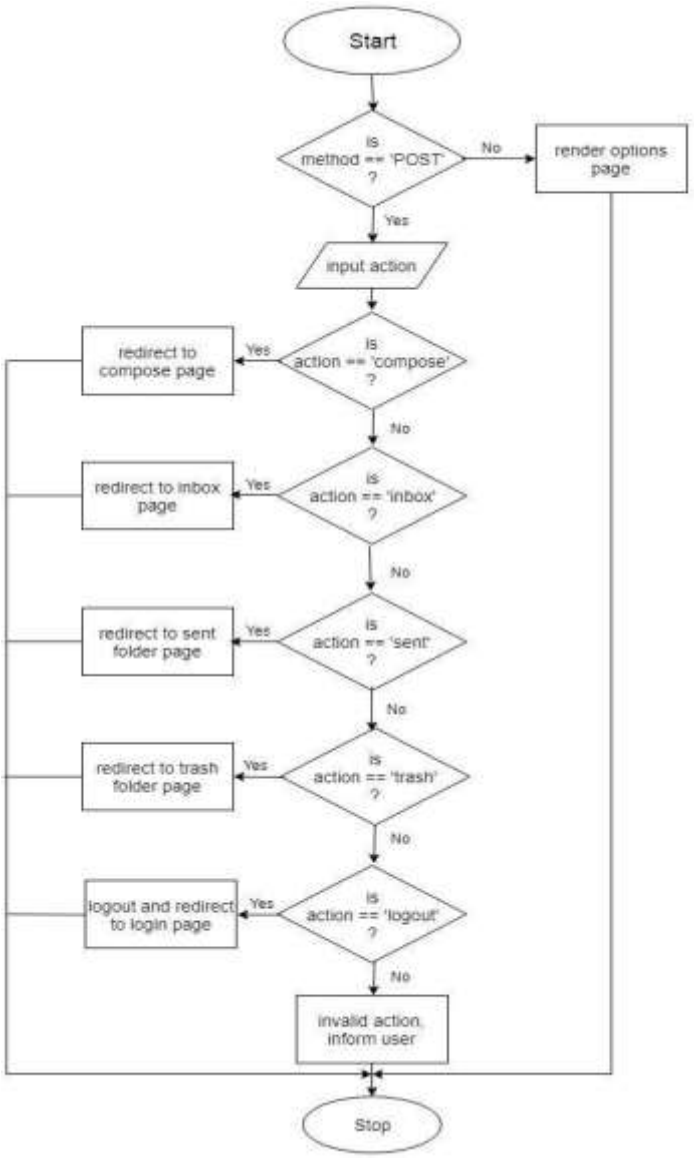

Figure: Options flow diagram

- If the request method is POST, the system proceeds to capture the user's intended action — this action is identified from their voice input. The flow then checks the specific command or intent:
- If the action is 'compose', the system redirects the user to the compose email page, where the user can dictate the recipient, subject, and body of the email.
- If the action is 'inbox', the user is taken to their inbox, where the system will likely read out new emails or list them with auditory navigation options.
- If the action is 'sent', the system directs the user to the sent items folder, allowing them to hear details of emails they have sent previously.
- If the action is 'trash', the user is shown the trash folder, possibly to review or recover deleted emails.

- If the action is 'logout', the system logs the user out and returns them to the login page, ensuring security and session management.

If none of these recognized actions are detected from the voice input, the system considers it an invalid action and inform the users with an appropriate voice response, guiding them to try again. This flow is specifically designed to simplify email navigation and interaction for visually impaired users, offering full voice control for common email operations.

C. Implementation

The process starts with thorough user research to understand the needs of visually impaired Android email users. Insights guide the design of an accessible interface with high-contrast visuals, large buttons, and easy navigation. A speech recognition system is then integrated to convert voice input into text for hands-free interaction.

1. Speech-to-Text Conversion:

Recognizer-Intent enables speech-to-text conversion, allowing users to speak and have their words transcribed into text. This feature supports multiple languages and aids visually impaired users by reducing the need for typing.

2. Text-to-Speech Conversion:

Text-to-Speech (TTS) engine converts written text into spoken words, supporting multiple languages. It allows visually impaired users to interact with content hands-free, improving accessbility and independence.

3. Mail Programming Module:

The mail module enables sending and receiving emails using standard protocols like SMTP, POP, and IMAP. It ensures compatibility through RFC 822 formatting, with SMTP using TCP port 25 for message delivery.

4. Sending Email:

Emails can be sent programmatically in Python using the smtplib module, which enables connection to SMTP servers like Gmail or Outlook. Developers create an SMTP object with host, port, and local server information, then use the sendmail() method to send a properly formatted email including sender, recipient, and message *body s = smtplib.SMTP(host, port, localhost).* This automation helps streamline communication tasks, especially useful in accessibility-focused applications.

5. Reading Email:

Python's imaplib module allows reading emails using the IMAP4 protocol by connecting to servers like imap.gmail.com. This helps visually impaired users access unread emails, which can then be read aloud using text-to-speech.

6. Searching Email:

The voice-based email system includes a search function in the Trash and Sent folders to help visually impaired users find specific deleted emails. Users initiate the search with a voice command and are prompted to speak the receiver's email address. The system captures and confirms the spoken input using voice recognition. Upon confirmation, a backend function, search_specific_mail, searches the relevant folder. Results are then read aloud to the user through text-to-speech.

This voice-driven process allows users to efficiently locate emails without relying on a visual interface.

IV. RESULT AND DISCUSSION

The proposed Voice-Based Email System for the Blind was evaluated through module-wise testing, focusing on three major components: Option Selection, Email Composition, and Inbox Management. The system was tested with visually impaired users in a controlled environment, and its performance was assessed in terms of accuracy, ease of use, error handling, and user satisfaction.

Option Selection Module

This module acts as the system's entry point, offering users voice-driven access to functions like compose, inbox, sent, trash, search, and logout. With a 96% voice recognition success rate, it ensured a smooth start and confidence for users. It handled errors gracefully by prompting retries, making it user-friendly for first-timers.

Figure: Options user interface

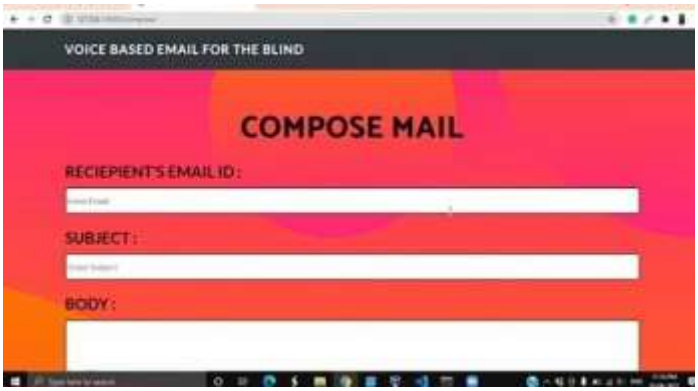

Figure: Compose user interface

Compose Module

This module enabled users to create and send emails entirely through voice, covering recipient input, subject, and body. Each step included voice confirmation and allowed re-entry of details, ensuring control and clarity. With a 92% task completion rate, users found the process intuitive after initial guidance.

Inbox Module

The inbox let users listen to unread messages and search emails using voice commands, achieving an 89% success rate. It handled empty inboxes efficiently and guided users smoothly. Minor pronunciation issues affected search, indicating a need for enhanced speech recognition adaptability.

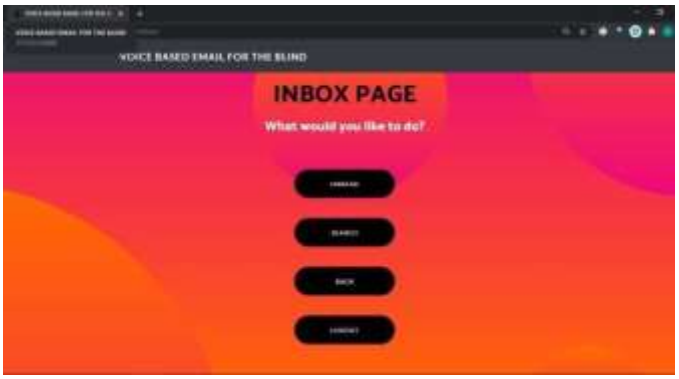

Figure: Inbox user interface

Sent Email Module

This module allowed users to review sent emails via voice commands. Users could search by receiver's email or navigate back or logout. It included confirmation steps to prevent errors and handled unrecognized commands with helpful prompts.

Trash Email Module

Similar to the Sent module, this allowed users to manage deleted emails through voice, including searching and listening to trash contents. Commands like "back" and "logout" helped navigation, while input confirmation and graceful error handling enhanced user experience.

V. CONCLUSION

In a world driven by digital communication, this innovative voice-based email system lights the way for visually impaired users making email truly hands-free and hassle-free. Built with accessibility, the system transforms routine email tasks into a smooth, voice-guided experience tailored for the blind.

The system empowers blind users to send, read, search, and delete emails entirely through voice commands, eliminating the need for a visual interface. With modules like Inbox, Sent, and Trash all voice-enabled, users can navigate and manage their emails effortlessly. Features such as voice confirmation, error handling, and smooth redirection enhance usability, ensuring an intuitive and seamless experience. This solution bridges the gap between accessibility and technology, fostering independence and confidence in digital communication.

ACKNOWLEGEMENT

We would like to express our sincere gratitude to the faculty and staff of Malnad College of Engineering, Hassan for their invaluable guidance and support throughout the development of our project on Voice Activated Email System For Visually Impaired. Special thanks to our project guide Dr. Uma B, Professor of Computer Science and Engineering for their continuous encouragement and insightful feedback. We also extend our appreciation to the reviewers for their constructive comments, which have played a crucial role in refining this work. Furthermore, we are thankful to our peers and collaborators for their contributions through thoughtful discussions and suggestions.

REFERENCES

[1] Jagtap Nilesh, Pawan Alai, Chavhan Swapnil, Bendre M.R., "Voice Based System in Desktop and Mobile Devices for Blind People", International Journal of Emerging Technology and Advanced Engineering (IJETAE), Volume 4, Issue 2, February 2014.

[2] Jagtap Nilesh, Pawan Alai, Chavhan Swapnil, Bendre M.R., "Voice Based System in Desktop and Mobile Devices for Blind People", International Journal of Emerging Technology and Advanced Engineering (IJETAE), Volume 4, Issue 2, February 2014.

[3] Jayachandran K., Anbumani P., "Voice Based Email for Blind People", International Journal of Advance Research, Ideas and Innovations in Technology (IJARIIT), Volume 3, Issue 3, 2017.

[4] Pranjal Ingle, Harshada Kanade, Arti Lanke, "Voice Based E-mail System for Blinds", International Journal of Research Studies in Computer Science and Engineering (IJRSCSE), Volume 3, Issue 1, 2016.

[5] Rahul Kumar, Vaishali Singh, Dr. Nikhat Akhtar, Mrs. Versha Verma, Srivastava, "Voice Based Email System for People with Visual Impairment", International Journal of Advances in Engineering and Management (IJAEM), 2021.

[6] Harivans Pratap Singh, Aman Pratap Kushwaha, Aayushmaan, Harendra Singh, "Voice Based Email System", International Journal of Innovative Science and Research Technology (IJISRT), Volume 6, Issue 7, July 2021.

[7] Saurabh Sawant, Amankumar Wani, Sangharsh Sagar, Rucha Vanjari, M. R. Dhage, "Speech Based E-mail System for Blind and Illiterate People", International Research Journal of Engineering and Technology (IRJET), Volume 5, Issue 4, April 2018.

[8] Rijwan Khan, Pawan Kumar Sharma, Sumit Raj, Sushil Kr. Verma, Sparsh Katiyar, "Voice Based E-Mail System Using Artificial Intelligence", International Journal of Engineering and Advanced Technology (IJEAT), Volume 9, Issue 3, February 2020.