

Review on Human Computer Interaction Driven Voice-Controlled Email Platform with Multimedia Attachment Capabilities for Blind Users

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Abstract

The People with visual disabilities face various challenges in accessing information and communication systems. One of the primary modes of communication is through emails. However, accessing emails can be challenging for people with visual disabilities. Since technology is growing day by day due to these types of problems, Blind people feel that they are more challenged. The system enables users to perform core email functions such as reading, composing, and sending messages entirely through voice commands, without the need for screen interaction or keyboard input. It incorporates secure login through Gmail API using app-specific passwords and supports file attachments within size limits. By combining Flask-based web development with speech recognition and audio output features, the system offers a practical solution to enhance digital communication accessibility. The application demonstrates how voice-enabled technology can be effectively utilized to promote inclusivity and autonomy in digital environments.

Keywords: - Voice-based email system, Email system for the blind User, Voice-assisted email,

mail document Attachments

1. INTRODUCTION

According to the World Health Organization, there are approximately 285 million Blind people worldwide. This number is expected to increase with the aging population. Email is one of the most used forms of communication in today's world, but literate Blind people face difficulties in accessing and using email due to their visual impairments. Email has become an essential communication tool today. Traditional email interfaces rely on visual cues such as buttons and icons, making it inaccessible for those with visual impairments. While screen readers and other assistive tools provide some support, they often fall short in offering a seamless and independent user experience.

By integrating speech recognition for input and text-to-speech technology for feedback, along with secure access to Gmail services through API authentication, this solution aims to enhance digital independence, usability, and communication for the Blind impaired community. Ultimately, the

project strives to promote digital equality and empower users with visual challenges to stay connected and productive in the modern world.

2. PROBLEM STATEMENT

Traditional email systems present significant accessibility barriers for blind and blind impaired users, as they heavily rely on visual navigation, complex menu structures, and screen-reader-limited compatibility, making even basic operations cumbersome. Tasks such as file attachments become nearly impossible due to the requirement of visual browsing, while authentication mechanisms like password fields and CAPTCHAs introduce further exclusion. Moreover, the absence of robust voice integration forces users into tedious keyboard-only navigation, and existing platforms provide visual-only error feedback, leaving accessibility-dependent users without meaningful guidance. Together, these challenges create a digital divide, restricting independent and efficient email management for users with visual impairments.

2.1 OBJECTIVE

- To enable seamless interaction between users and email services through a voice-controlled interface, eliminating the need for visual navigation.
- To incorporate robust error-handling mechanisms that ensure accurate speech recognition and smooth email processing.
- To develop a secure authentication system for safe and reliable voice-based email access.
- To empower the Blind community by providing independent access to email communication without external assistance.

- To extend functionality by enabling users to send PDF, DOC, and audio files below 10MB, ensuring practical, real-world usability.

3. LITERATURE REVIEW

1] Sherly Noel, This paper work on Google web kit API for speech recognition. Investigation made on the application proves effectiveness, compared with various parameter like accent, pace, audible distance words per minutes, accuracy depict on graphical analysis

2] Kumar, Sumit, et al. This paper's ambition is to create an electronic mail system that will support even Blind challenged people to use these service areas to communicate without earlier exercise. By which machine will no longer permit the client to utilize the console alternatively will work best on mouse operation and speech conversion to text. Even, the present device could be utilized by anyone too as an instance, the one like the person who can't even study. The device is totally primarily reached from cooperative voice feedback to be able to make it clear and efficient to apply.

3] Haider, Nasim, et al. The author conducted a usability study with ten visually challenged participants to evaluate the system's user experience and acceptance. The study involved a pre-test survey, a training session, and a task-based evaluation. They used a mixed-method approach that involved both qualitative and quantitative data collection. The results show that the voice-based email system was generally well received by the visually challenged participants. Most participants found the system easy to use and navigate, and they appreciated the convenience of being able to send and receive emails using their voice.

4] Khan, Rijwan, et al. In this paper, the author, for helping these people and developing society, has come up with this idea that helps a visually challenged person by providing the ability to send and receive emails and throw voice commands without using any keyboard and visual thing.

5] Badigar, Milan, et al. The author in this paper is going to build an application that will help blind people to send and read emails as ordinary people do. The application will not let the user make use of the keyboard, instead will work on text to speech and vice versa to facilitate sending, reading, forwarding and replying to emails using an android smartphone. The app will be developed on the android platform. Our speech-to-text module directly acquires and converts speech to text. Speech recognition is done via the Internet, connecting to Google's server.

6] Naresh, V. S., et al. The proposed work focuses on addressing the communication challenges that visually impaired individuals face in using emails, a crucial mode of online interaction. We recognize that emails play a pivotal role in sharing vital information and fostering connections in the digital era. However, for the visually impaired, traditional email interfaces can be cumbersome and inaccessible. To bridge this gap, they are dedicated to developing a voice-based email system tailored specifically for the visually impaired. Their primary objective is to streamline the email process on computers, effectively removing the necessity for typing. Leveraging advanced technologies such as speech-to-text (STT), text-to-speech (TTS), and interactive voice response (IVR), we intend to create a seamless and intuitive interaction experience within the email system.

7] Rana, Manish, et al. This study aims to develop an email system that will allow even the most unskilled visually impaired person to interact using

the services without any prior training. The system provides the user with a voice based assistant which helps users to perform basic tasks related to handling email by giving voice commands thus providing a user friendly and interactive experience to the users.

8] Choi, Jungyoon, et al. In this paper, the author aimed to develop independent report generation software, VTR4VI (Voice to Report program for the Visually Impaired) for students with visual impairment by using mobile devices that are always in possession. Since the existing speech recognition document editing software is designed for non-visually impaired people, it is difficult for the visually impaired to use. Accordingly, the requirements of a report generator for blind students were identified so blind students could freely perform assignments or write reports without helpers, just like non-visually impaired students. This software can be easily used by clicking on the Bluetooth remote control instead of touching the phone screen, and the operation is simple. As a result of our usability evaluation, our VTR4VI will surely help the visually impaired to study and make a written report.

9] Rajput, Gaurav Kumar, et al. In this paper, a Speech completely messaging device is suggested using Py but instead Ai to save time for externally examined people. Its device gives those who have been evaluated on the outside some power of contact and considerably increases their sense of stability as objectivity. With the use of that invention, blind persons will indeed be able to send out emails just like other regular citizens. Voice-based messaging systems use cutting-edge technology to ensure their legitimacy to people who have been vetted on the outside.

10] P. Tyagi, et al. In this paper, the author aims to develop an application that provides the blind

people with the ability to send emails using voice without the keyboard or the other visual things. Thus the author made a one to one chat system that just converts from audio to text and text to audio so that visually challenged can just use it easily.

10] Meshram, Amita, et al. This project aims at developing an email system that will help visually impaired people. The system will remove the use of keyboard; instead will work primarily on mouse operation and speech to text. The system is completely based on interactive voice response, which will make it user friendly and efficient to use.

4. METHODOLOGY

The proposed system is built with an accessibility-first design, offering voice-first interaction, high-contrast UI, and screen reader compatibility to ensure inclusivity. It incorporates a dual-layer voice processing mechanism that leverages Google Speech Recognition for accurate input and pyttsx3 for text-to-speech (TTS), with multiple language fallbacks for versatility. A seamless email integration module is provided through SMTP/IMAP protocols, supporting multi-folder operations for smooth communication. To enhance productivity, the system includes intelligent file handling, enabling voice-controlled attachment management with smart Windows location detection. Security is reinforced with a robust authentication system based on session control and voice keyword mapping. For reliability, the design integrates comprehensive error management, ensuring multi-layered error handling and graceful degradation during failures. Finally, the system is built on a modular Flask architecture, allowing scalability and maintainability with clearly separated REST API endpoints for smooth integration and future expansion with multimedia attachments such as image, text documents and pdf documents less than the capacity below 10MB.

5. FLOW DIAGRAM

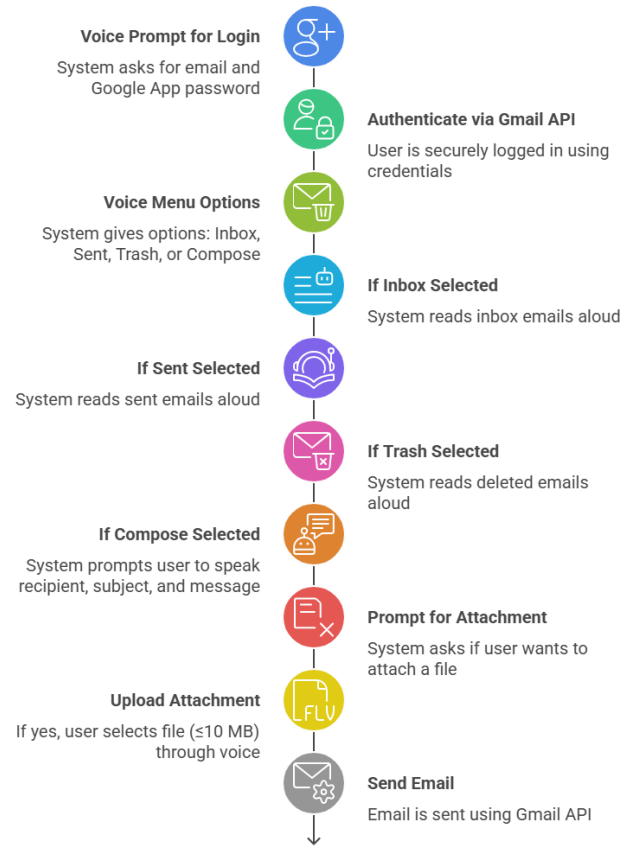


Fig (1) shows the flowchart of the system

5.1 Voice Mail System Requirement

Software Component	Function	Description
Programming Language	Python	Core development language for implementing the system.
Framework	Flask	To build the backend web application and

		handle server side processing.
API	Gmail API	Enables the system to send, read, search, and manage emails securely using Google services.

6. CONCLUSION

The proposed voice-based email system aims to assist Blind people in accessing and sending emails more efficiently. The mail structure will be utilized by any blind person easily. By integrating Python, Flask, speech recognition, and text-to-speech with secure Gmail API access, the system provides a fully voice-controlled, hands-free email management experience. Its ability to read, compose, and send emails, along with support for necessary multimedia attachments, ensures independence, privacy, and efficiency for Blind users. This innovative approach not only enhances accessibility but also empowers users to engage confidently in digital communication without relying on external assistance.

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