



# Voice-Based Email System for Visually Impaired

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**Abstract :** The Voice-Based Email System is designed to enhance accessibility for visually impaired users by enabling them to manage email communications through voice commands. By leveraging advanced voice recognition and synthesis technologies, the system offers a user-friendly interface, prioritizing inclusivity and fostering independence for all users. Index Terms—Speech Recognition, Voice-based, Visually Impaired/Challenged Person, Email, Communication, System.

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## I. INTRODUCTION

The Email Assistant is a groundbreaking Python-based application that redefines the way email management is approached by seamlessly integrating advanced face recognition technology with intuitive voice command functionality. This innovative system not only enhances security but also provides an efficient and user-friendly communication experience, meticulously designed to meet the needs of today's tech-savvy users. By combining these cutting-edge technologies, the Email Assistant creates a highly secure environment while enabling effortless, hands-free email handling. Users can efficiently send, read, and organize their emails without compromising on security, thanks to the implementation of state-of-the-art facial recognition mechanisms. This application is particularly beneficial for individuals who face accessibility challenges or those who desire to optimize their email management processes with modern, streamlined methods. By addressing significant limitations inherent in traditional email systems, the Email Assistant introduces a paradigm shift in security and accessibility standards. Its forward-thinking design not only simplifies daily communication but also fosters inclusivity by catering to diverse user needs. Leveraging the potential of biometric authentication and advanced voice technology, the system represents a revolutionary step in email interaction management. It paves the way for a future where communication tools are more secure, accessible, and tailored to individual requirements, setting a benchmark for innovation in the domain of digital communication.

## II. RELATED WORK

The paper offers an in-depth analysis of assistive technologies aimed at individuals with visual impairments. Dasgupta, Tirthankar, and their team [1] focus on developing audio systems for desktop and mobile platforms. Their approach features several notable innovations, such as a design with customizable templates, various email options, and a user-friendly graphical interface specifically for visually impaired users. They also address existing limitations by introducing voice-based solutions that improve email accessibility. The study further explores how these technologies adapt to mobile devices, addresses hardware limitations, and optimizes the graphical user interface for touchscreens. Performance is evaluated using the Key Level Model (KLM), which provides a comparative assessment of the voice system's effectiveness against traditional email methods. This research makes a significant contribution to enhancing digital accessibility for visually impaired users.

In their review, Tiwari, Paulus A., and colleagues [2] evaluate the current state of speech-based email systems for visually impaired users, pointing out the deficiencies of existing solutions for those who rely on visual feedback. The review advocates for simplified, voice controlled email interfaces to enhance usability and accessibility. It also covers recent advancements in speech recognition (SR) technology, underscoring its vital role in facilitating voice-controlled communication and improving accessibility. The article reviews current developments in assistive technologies, including text-to-speech systems, reading analysis, and web navigation tools, highlighting the importance of incorporating voice communication technology to meet diverse user requirements.

Iglesias, Rubn, et al [3] here describe a new tactile audio virtual environment that allows blind people to use touch (using binary new related to haptic interfaces) and improved Audio output and with voice commands. This system was developed in the European project "GRAB". The new system provides a unified approach to the design and development of audio-tactile applications in various fields (architecture, art, aviation, medicine). To demonstrate the effectiveness of the approach, the project created three applications

specifically for the visually impaired: an adventure game, a city map browser, and a map browser. Both new sites and applications are tested by blind people with different characteristics (blind from birth, low vision) to evaluate the usefulness and usability potential of these developments.

The advancement of communication technologies has significantly reshaped the digital landscape. Noel and Sherly [4] have developed an application that simplifies email writing for everyone, including those with visual impairments. This app allows users to input text through voice commands rather than traditional typing. It recognizes and matches the user's voice to a reference sample before recording and executing the command. By incorporating daily quotes, the app helps reduce the mental effort required for remembering information. Its primary goal is to facilitate speech-to-text (STT) conversion for composing emails and text-to-speech (TTS) conversion for reading emails aloud.

In the realm of CTI and VoIP technologies, Wang, Jingyang, et al. [5] highlight the increasing importance of VoIP-based voicemail systems. To minimize development costs and expedite the development process, they recommend utilizing digital sound cards and VoIP solutions. Their article details the design and functionality of VoIP-based voicemail systems, provides comprehensive instructions for message sending and system use, and notes that the system has performed effectively once implemented. These insights are valuable for developing similar features using digital sound cards.

Harshasri, Mullapudi, Manyam Durga Bhavani, and Misra Ravikanth [6] describe a voice-based email system designed for blind users, offering a user-friendly way to manage email through voice commands. This system is presented as a standalone application, improving usability over web-based platforms. It includes authentication features to handle user details such as names, email addresses, and passwords. Upon launching the app, users are greeted with options like Read Mail, Decline, Read All Mail, Subscribe, and Manage Subscriptions. The system primarily relies on voice commands for interaction, allowing users to send emails, access new messages, and manage their inbox effectively. Chatbots within the app assist users by guiding them through various functions and providing immediate feedback.

### III. EXISTING SYSTEM

Currently, many basic email systems that aim to improve accessibility use voice recognition and text-to-speech technologies. These systems often require users to remember keyboard shortcuts to access various functions. They also incorporate features such as Interactive Voice Response (IVR), speech-to-text converters, mouse click simulations, and screen readers to facilitate email interactions. For instance, users might find a microphone icon that, when activated, allows them to dictate their emails. The system then transcribes these spoken words into text, enabling visually impaired users to read and understand their messages.

Despite these advancements, existing voice-based email systems have significant limitations. A major drawback is their reliance on mouse-based interactions for tasks like sending and receiving emails, which can be challenging for users who have difficulty using a mouse. Additionally, the web-based interfaces employed by some systems are not always designed with accessibility in mind, which can result in usability issues for visually impaired individuals.

### IV. RESEARCH METHODOLOGY

#### A. User Interaction and Input Processing:

At the heart of the system lies the User component, representing visually impaired interact with the system. Users provide spoken instructions, which are captured by the Speech Recognition component. Utilizing state-of-the-art voice recognition technology, this component accurately transcribes spoken words into text, enabling the system to process user requests effectively.

#### B. Email Operations and Authentication:

The Email Server component serves as the backbone of email-related operations, connecting to the email service provider's server to facilitate email sending and receiving. Before initiating any email-related activities, the system rigorously verifies user login details through the Authentication component. This component ensures a secure environment by authenticating user credentials against stored data, granting authorized access to email accounts.

#### C. User Authorization and Input Handling:

Upon successful authentication, users navigate to the Compose Email component, where they provide recipient email addresses, message bodies, and topics through intuitive audio prompts. The Natural Language Processing (NLP) component serves a crucial role in processing user input, extracting pertinent information to facilitate email composition and processing.

#### D. Accessible User Experience:

To ensure an inclusive and accessible user experience, the system incorporates the Text-to-Speech (TTS) Converter component. This component converts system outputs, including email content and confirmation messages, into voice format, enabling visually impaired users to receive and comprehend system responses effectively.

#### Information Flow and Interaction:

The architectural diagram visually depicts the flow of information and interactions among system components. Arrows delineate the path of user input, information processing, and system responses, highlighting the seamless interaction between components in facilitating email communication via voice commands.

### V. RESULTS AND DISCUSSION

In the results and discussion section of our study on speech-based email systems for visually impaired users, we analyzed the system's performance and user feedback. Our findings indicate that the system performs effectively, with high accuracy in recognizing speech commands and completing email tasks promptly. However, we did face some implementation challenges, such as limitations on usage and difficulties in adapting to various user needs. Despite these issues, feedback from users was largely favorable, with visually impaired participants noting their satisfaction with the system's respectful interactions and

overall usability. Nevertheless, we identified areas for improvement, particularly in tailoring the system to better meet individual user preferences and different environments. When compared to existing alternatives, our voice-based email system provides unique advantages, especially in terms of accessibility and user engagement for visually impaired individuals. Future research will concentrate on enhancing speech recognition capabilities, improving the user interface, and resolving current limitations to boost the system's effectiveness. Overall, our research highlights the critical role of technological advancements in aiding visually impaired users and improving digital accessibility.

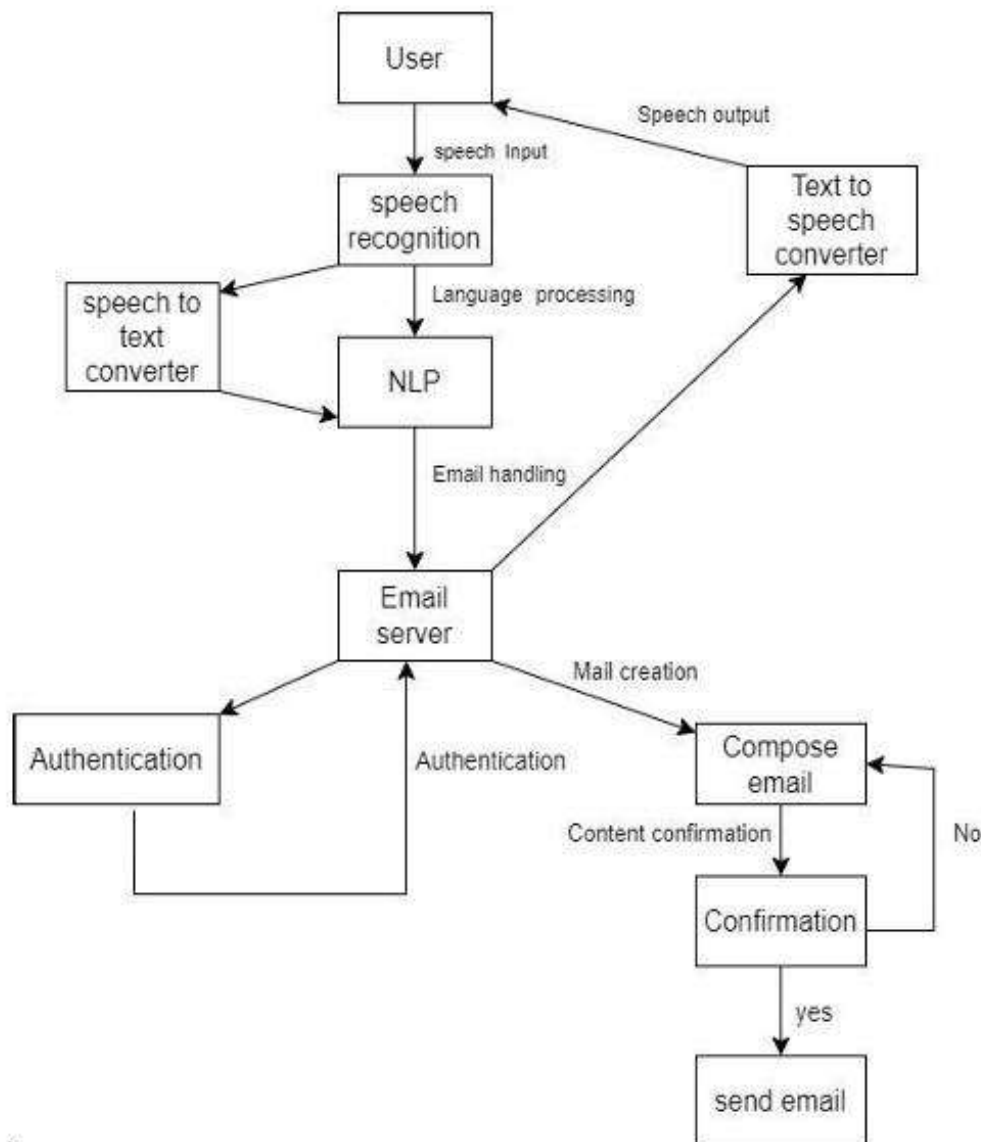


Figure: 1

## VI. CONCLUSION

The development of the Voice-Based Email System for people with visual impairments marks a significant advancement in digital accessibility. Our objective has been to build a solution that allows these users to independently handle and interact with their emails using a voice-controlled interface. This system incorporates advanced speech recognition and natural language processing, along with integration with assistive technologies, enabling users to manage their emails through simple voice commands and auditory feedback. This approach addresses the limitations of conventional email systems, aiming to enhance autonomy, confidence, and inclusion for those with visual impairments. We anticipate ongoing improvements and feature expansions to keep up with user needs and technological progress.

## VII. FUTURE WORK

While the Voice-Based Email System has made significant strides in improving email accessibility for visually impaired individuals, several opportunities for future enhancement and development remain:

- **Enhanced Speech Recognition Accuracy:** Further refinement of speech recognition algorithms and models to improve accuracy, especially in interpreting complex sentence structures and accents, would enhance the overall user experience.
- **Advanced Error Handling Mechanisms:** Implementation of robust error detection and recovery mechanisms to handle misunderstood commands or speech input errors, ensuring smoother interactions and reducing user frustration.
- **Integration of Additional Functionalities:** Expansion of the system's capabilities to include advanced email management features like inbox organization, email filtering, and email summarization, providing users with comprehensive email management tools.
- **Personalization and User Adaptation:** Integration of machine learning algorithms to tailor the user experience according to individual preferences and usage patterns, enabling the system to adapt and enhance continually.

- **Accessibility Improvements:** Continual focus on accessibility enhancements to ensure the system remains inclusive and user-friendly for individuals with varying levels of visual impairment or other disabilities.
- **Integration with Assistive Technologies:** Collaboration with assistive technology providers to integrate the Voice- Based Email System with existing assistive devices or software, expanding its reach and accessibility to a wider user base.
- **Security and Privacy Augmentations:** Implementation of robust security measures to safeguard user data and ensure the privacy and confidentiality of email communications, including encryption techniques and multi-factor authentication options. By focusing on these areas for future improvement, the Voice-Based Email System can continue to evolve, offering an accessible and efficient solution for email management. solution for blind individuals, equipping them to engage effectively in the digital realm.

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