VOICE BASED EMAIL SYSTEM FOR VISUALLY IMPAIRED

A PROJECT REPORT

Submitted in partial fulfillment of the requirements for the degree of

**Bachelor Of Technology In
Computer Science & Engineering**

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<u>FIGURES</u>

CERTIFICATE

This is to certify that the thesis entitled **"Voice Based Email System For Visually Impaired"** submitted by Nidhi Dhiman, Kavita Gaira, Ajay Mridha and Aman Kumar, for the award of the degree of *Bachelor of Technology(CSE)*, is a record of bonafide work carried out by him/her under my supervision during the period, 10. 02. 2023 to 10. 05. 2023, as per the UIT code of academic and research ethics.

The contents of this report have not been submitted and will not be submitted either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university. The thesis fulfills the requirements and regulations of the University and in my opinion meets the necessary standards for submission.

DECLARATION

I hereby declare that the thesis entitled **"Voice Based Email System For Visually Impaired"** submitted by me, for the award of the degree of *Bachelor of Technology* is a record of bonafide work carried out by me under the supervision of Mr. Anuj Kumar.

I further declare that the work reported in this thesis has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Place : Dehradun   Nidhi, Kavita, Ajay, Aman
Date : 11/05/2023   **Signature of the candidate**

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ABSTRACT

The integration of communication technology and the internet has revolutionized the way people communicate, making it much easier and faster. However, people who are visually impaired face many challenges in accessing and using these technologies, as they require vision to navigate through them. While many advances have been made in technology to make computers more accessible for people with visual impairments, these individuals often require some training and practice to become proficient in their use. To address this issue, this paper proposes the development of an email system that is specifically designed for visually impaired individuals. The system is designed to be highly accessible, requiring no prior training or experience to use. Unlike conventional email systems that require keyboard input, this system utilizes mouse operations and speech-to-text conversion for input. The email system developed in this paper is entirely voice-activated, allowing users to navigate and operate the system using only their voice. This makes the system highly user-friendly and efficient, even for people who cannot read or write. The system is designed to provide a seamless and efficient email experience for visually impaired users, eliminating the barriers to communication that they often face.

In addition to its accessibility features, the email system developed in this paper is also highly efficient and reliable. The system is designed to be fast and responsive, with minimal lag or delay in operation. It also features a highly intuitive user interface that makes it easy for users to navigate through their emails and perform various actions.

Overall, the development of an email system specifically designed for visually impaired individuals is an important step towards creating a more inclusive and accessible society. By leveraging the power of communication technology and speech recognition, we can provide visually impaired individuals with the tools they need to communicate effectively and efficiently. With continued advancements in technology, we can continue to create new solutions that cater to the needs of all individuals, regardless of their abilities.

<u>INTRODUCTION</u>

The internet is considered to be an important information stored in today's world. Of all the methods available, email is one of the most popular forms of communication, especially in the business world. However, not everyone has access to the Internet. It doesn't matter if you can't see it. This makes the Internet a completely useless technology for
the blind and illiterate. Even currently available systems, such as TTS and his ASR screen reader, do not allow blind people to use the Internet efficiently enough. With an estimated 285 million people worldwide who are visually impaired, it is imperative that they also have
access to Internet facilities for communication.

The internet has revolutionized the way we interact with each other and how we access information. It has become an indispensable tool for many people, whether for work or personal use. The internet is a vast network of information, allowing us to access a wide range of resources, from news articles to educational materials and entertainment. One of the primary ways people use the internet is for communication. Email is a popular form of communication, particularly in the business world, where it is used extensively for exchanging information and collaborating with colleagues. With the rise of social media and messaging apps, communication has become even easier and more instantaneous.

However, despite the widespread availability of the internet, not everyone has access to it. In some parts of the world, internet access is limited, while in others, it is simply too expensive for many people to afford. This digital divide means that millions of people are unable to take advantage of the benefits of the internet. Furthermore, even for those who have access to the internet, there are still barriers to use. For example, for blind or visually impaired individuals, navigating the internet can be a significant challenge. Text-to-speech (TTS) and automatic speech recognition (ASR) software has made it easier for blind people to use the internet, but these tools are not perfect and can still be difficult to use efficiently.

Similarly, for those who are illiterate, the internet can be a daunting and inaccessible place. Without the ability to read or write, it is difficult to navigate websites or communicate effectively. The importance of internet access cannot be overstated. The internet is a vital resource for education, employment, and social interaction. Without it, many people are left at a disadvantage, unable to access critical information or connect with others. Fortunately, efforts are being made to bridge the digital divide and make the

internet more accessible to all. Governments, non-profits, and tech companies are working together to expand internet access and develop new tools to help people with disabilities use the internet more effectively. In conclusion, while the internet has revolutionized the way we live and work, there are still many barriers to access that must be overcome. By working together and developing new technologies, we can ensure that everyone has equal access to this essential resource.

The voice-based system allows users to listen to their emails and compose responses using only their voice, thereby eliminating the need for a keyboard. Moreover, users can easily navigate through the email interface and perform tasks such as replying, forwarding, or deleting messages using simple voice commands. The system is designed to be highly intuitive, with features such as voice recognition technology and a speech synthesis module that makes the user experience seamless. The system's voice recognition technology allows users to speak naturally, without needing to learn complex voice commands or phrases.

The project's goal is to improve accessibility for people with disabilities and provide them with a more streamlined way of accessing their email. By creating an email system that is easy to use and requires minimal knowledge of computer systems, we hope to help blind individuals overcome barriers to communication and improve their quality of life. The development of this voice-based e-mail system is a step towards achieving a more inclusive society where everyone can participate equally. As technology continues to advance, it is important that we continue to develop solutions that cater to the needs of all individuals, regardless of their abilities.

In conclusion, the voice-based e-mail system developed for this project offers a simple and effective solution to the challenges faced by blind individuals when accessing email. By eliminating the need for keyboard shortcuts and other computer-related knowledge, the system makes it easy for everyone to access and use email. This project is a testament to the potential of technology to improve the lives of people with disabilities and create a more inclusive society.

LITERATURE REVIEW

In this part, we provide a thorough evaluation of relevant recent studies. In a paper[1], a voice-based email architecture is suggested that will make email more accessible to blind people. Since the existing technology cannot provide aural feedback while reading aloud, blind people cannot use it. The suggested system makes use of mouse click events, interactive voice responses, and speech recognition. In order to further increase security, speech recognition is also employed for user verification.

The proposed system can greatly benefit the visually impaired community by providing them with a more accessible means of communication. This can improve their social interactions and enhance their overall quality of life. The use of speech recognition technology for user verification can also increase the security of the system. This can prevent unauthorized access to the user's email account and protect their sensitive information. The system's registration process ensures that the user's personal information is securely stored and not shared with unauthorized parties. However, there are some potential limitations to the proposed system. For example, the accuracy of the speech recognition technology can vary depending on the user's accent, speech rate, and background noise. This can affect the user experience and may lead to errors or misunderstandings.

Moreover, the system's reliance on mouse click events may pose a challenge for users who have limited mobility or dexterity. The system may need to incorporate alternative input methods to ensure accessibility for all users.
Despite these potential limitations, the proposed system shows great promise in providing a more accessible and secure means of email communication for blind people. Further research and development can help improve the system's accuracy, accessibility, and usability, ultimately leading to a better user experience for visually impaired individuals.

The system's first module is registration. The user will be prompted to enter essential information so that this module can gather all of their data. In the second module, the system will request the user's username and password.
This is accomplished by using voice commands.

An email system that is simple for those with visual impairments was presented in the paper [2]. The three modules that make up the system's design are Text-to-speech (TTS), Speech-to-text (STT), and Mail Programming modules (Compose, Mailbox, and Sent Mail). The Text-to-speech (TTS) module in the system's design uses AI to generate natural-sounding speech from written text. It can be used for a variety of applications, such as creating

audiobooks, generating voiceovers for videos, or even helping people with visual impairments by converting text to speech. On the other hand, the Speech-to-text (STT) module allows users to convert spoken words into text, which can then be processed by the system's other modules. This technology is commonly used in voice recognition software, virtual assistants, and transcription services. The Mail Programming modules (Compose, Mailbox, and Sent Mail) enable users to send and receive emails through the system. Compose allows users to create new emails, Mailbox displays incoming emails, and Sent Mail shows emails that have been sent. The use of neural network models in the STT module allows for more accurate and efficient speech recognition than previous speech-to-text technology. This is because neural networks are designed to learn from large datasets and can adapt to variations in speech patterns and accents.

Furthermore, the system's AI capabilities enable it to learn from user behavior and improve its performance over time. This means that as more data is processed by the system, it can become more accurate and efficient in its tasks. Overall, the system's design and implementation showcase the potential of AI in improving traditional computing processes and providing a more secure and efficient user experience. As AI technology continues to evolve, it is likely that we will see even more innovative applications and systems that make use of its capabilities.

In their publication [3], the authors put forward a solution for the accessibility of electronic mail for blind people. The proposed solution is simple-to-use and incorporates the Viterbi Method, as well as a Speech to Text and Text to Speech converter. The system operates on an algorithm that selects the best-matching word as soon as the user types it, by comparing the anticipated word with the voiced word. Prior registration is required for the user to access the website for the first time. This solution has several advantages over the old method, which included several drawbacks. One of the drawbacks of the Viterbi algorithm was its efficiency, which decreased as the number of errors increased. Additionally, the old method took up more space. With the proposed solution, these issues are significantly reduced. The system is more efficient, takes up less space and is easier to use. The use of Speech to Text and Text to Speech converter allows users to communicate effectively without having to rely on someone else to read or write emails for them. This solution is a significant improvement for the accessibility of electronic mail for blind people and enhances their independence and inclusion.

The authors of the paper published in article [4] proposed a solution for the email-related challenges faced by visually impaired individuals when using smartphones. They introduced a mail client called Tri Mail, which aims to improve the accessibility and usability of email activities for the blind. To develop Tri Mail, the authors built on the foundation of an HCI (human-computer interaction) model and created a user framework called

Tetra Mail. This framework provides a basis for the design and development of email clients that are optimized for the needs of blind users. The interface of Tri Mail is designed in such a way that even a blind user with no prior experience with touch interfaces can navigate it with ease. The design is intuitive and straightforward, with large, easily identifiable buttons and text. To ensure accessibility, Tri Mail uses a combination of audio and haptic feedback, allowing blind users to receive information about their inbox and messages without having to rely solely on visual cues. This feature is especially important for users who are not proficient in Braille.

In addition, Tri Mail includes several innovative features that enhance the overall user experience. For instance, the application includes a feature that allows users to quickly and easily filter messages based on their content. This feature is particularly useful for individuals who receive a large number of emails and need to prioritize their messages. Another useful feature of Tri Mail is the ability to use voice commands to perform various tasks, such as composing and sending emails. This feature eliminates the need for users to navigate through menus and options manually, making the application much faster and more convenient to use.

Overall, the authors' work on Tri Mail represents an important step forward in improving the accessibility and usability of email clients for the visually impaired. The application's intuitive design and innovative features have the potential to significantly improve the email-related experiences of blind users on smartphones.

In their study [5] Saurabh Sawant offers a groundbreaking solution for individuals who are visually impaired or illiterate, enabling them to enhance their engagement with email. This solution represents a significant improvement over previous technologies such as IVR, which relied on screen readers and Braille keyboards, making it more accessible and user-friendly.

The new method employs a system that converts speech to text and vice versa, utilizing voice inputs for a variety of tasks. To utilize the system, users need only register their email address and password, and the PHP mailers feature is used to send emails, providing an efficient and straightforward way to communicate.

Additionally, the system utilizes the Knuth-Morris-Pratt Algorithm to search for emails in inboxes, providing quick and efficient access to users' messages. The system environment is entirely voice-driven, ensuring that there is adequate system input at every stage. However, one limitation of this system is that it is only compatible with Gmail as a host server, restricting its use to Gmail users exclusively, and not compatible with other email providers like Yahoo. Nevertheless, this innovative solution represents a significant step forward in improving email accessibility for individuals with visual impairments or literacy challenges.

In paper [6], a voice-based email architecture is proposed which will help blind people to access email. The existing system is not user-friendly for blind people as it does not give any audio feedback to read out contents for them. The proposed system makes use of Speech Recognition, Interactive Voice Response, and Mouse Click events, enhancing the user experience. Additionally, voice recognition is utilized for user verification to ensure added security.The system consists of multiple modules designed to streamline the user's interaction. The first module is Registration, where the user is prompted to enter their complete information. Voice commands guide the user through the process, enabling a seamless experience. Following registration, the second module is the login module, where the system asks the user to provide their username and password through voice commands. Voice verification is then performed by requesting another voice sample.

Once the login is successfully completed, the user is redirected to the inbox page, where they can access their email messages. The system offers various options, including Compose, Inbox, Sent Mail, and Trash. By utilizing voice commands, users can effortlessly switch between these options, enhancing their accessibility and convenience. The Compose option allows users to draft new emails by dictating the content through their voice. The system converts their speech into text and populates the email body accordingly. This feature enables blind users to compose emails effortlessly without the need for traditional keyboard input. In the Inbox section, users can navigate through their received emails using voice commands. The system provides audio feedback by reading out the sender, subject, and other relevant information of each email. This allows blind users to stay updated with their incoming messages effectively. Similarly, in the Sent Mail section, users can access their sent emails and retrieve specific information by using voice commands. The system presents the necessary details in an audible format, providing blind users with seamless access to their sent correspondence. The Trash option allows users to manage their deleted emails through voice commands. By utilizing the system's speech recognition capabilities, blind users can effortlessly delete, restore, or permanently remove emails from the trash folder.

Overall, the voice-based email architecture proposed in [6] aims to bridge the accessibility gap for blind individuals. By leveraging speech recognition, interactive voice response, and intuitive voice commands, the system empowers blind users to independently access, manage, and interact with their emails in a user-friendly and efficient manner. This innovative solution has the potential to significantly improve the email experience for blind people, fostering inclusivity and equal access to communication technology.

In the paper [7], the proposed system introduces several major components that enhance the accessibility of the email and multimedia functions of the operating system for blind individuals. These components are outlined below:

1. G-mail System: The system incorporates functionality that allows blind users to have their emails read aloud to them directly from their recipient mailbox. This feature enables users to stay up to date with their email correspondence without relying on visual interfaces.

2. RSS (Real Simple Syndication) for News: The system includes an RSS module, which provides blind users with the ability to access and listen to news headlines and update notices. By leveraging RSS technology, blind individuals can easily stay informed about current events and news updates.

3. Song-Listen Songs: Another component of the proposed system is the ability to listen to songs. Blind users can use voice commands to browse and select songs from their music library, enabling them to enjoy their favorite music without the need for manual input.

4. Book Reader-System Red Book: The system introduces a book reader module called "Red Book." Blind individuals can utilize this module to access and listen to digital books. By converting text into speech, the system enables blind users to engage in literary content effortlessly.

5. Drive Browser: The system includes a drive browser feature that facilitates the searching and navigation of drives and folders. Blind users can utilize voice commands and audio feedback to locate and access specific files and directories, providing them with efficient management of their digital content.

The proposed architecture aims to create an accessible and intuitive user interface for blind individuals. By combining voice commands and mouse clicks, the system eliminates the need for a traditional keyboard input, making it easier for blind users to navigate and interact with the graphical user interface (GUI). In addition to the email component, the system also developed an RSS module that allows blind users to receive and listen to news headlines and updates. Furthermore, the researchers developed a mobile application that offers the same functionalities, extending the accessibility to a wider range of devices.

The versatility of the system extends beyond email, as other applications can also be accessed using voice commands. By implementing this comprehensive approach, the proposed system empowers blind individuals to independently navigate and utilize various software applications, enhancing their overall user experience and promoting inclusivity in the digital realm.

The aim of this research is to overcome the limitations of existing systems and provide an efficient and user-friendly voice-based E-Mail system for visually impaired individuals. The literature review revealed several technologies that have been utilized in the development of voice-based systems, including speech recognition, natural language processing, and text-to-speech conversion. The proposed model incorporates state-of-the-art advancements in these technologies to ensure accurate voice recognition and clear and concise content delivery. By harnessing the power of advanced voice recognition algorithms, the system aims to accurately transcribe spoken messages into text format, enabling visually impaired users to compose emails effortlessly.

Moreover, the integration of natural language processing techniques allows for enhanced comprehension of the user's intent, facilitating a more intuitive and streamlined user experience. To ensure accessibility, the system will utilize high-quality text-to-speech conversion algorithms, enabling visually impaired users to listen to their received emails effortlessly. The proposed system seeks to address the limitations of existing screen readers, such as inaccuracies in voice recognition and suboptimal content delivery. By leveraging the advancements in technology, this model aims to provide visually impaired individuals with an efficient and reliable means of accessing and managing their emails. The research also emphasizes the importance of user testing and feedback to continuously improve the system's performance and usability. Through iterative development and refinement, the proposed voice-based E-Mail system strives to become a valuable tool for visually impaired individuals, empowering them to communicate effectively and independently. By considering the specific needs and challenges faced by visually impaired users, the proposed system aims to bridge the accessibility gap and provide an inclusive solution for email communication.

The implementation of this system could potentially have a significant impact on the daily lives of visually impaired individuals, improving their productivity, efficiency, and overall quality of life. Further research and development in this area will contribute to the advancement of assistive technologies and promote inclusivity in the digital realm. The proposed voice-based E-Mail system is envisioned to be a stepping stone towards

creating more accessible and inclusive technologies for individuals with visual impairments. By leveraging cutting-edge advancements in technology, this system has the potential to revolutionize the way visually impaired individuals interact with email communication.

The success of this model could pave the way for further innovations in assistive technologies, fostering a more inclusive and equitable society.

It is important to ensure that the proposed system adheres to established accessibility guidelines and standards to guarantee compatibility and usability across different platforms and devices. Through collaboration with stakeholders and accessibility experts, the system can be tailored to meet the unique needs and preferences of visually impaired users. The proposed system's integration with existing email platforms and services would enhance its versatility and usability, allowing users to seamlessly transition to the voice-based interface.

Overall, the literature review highlights the significance of developing a robust and efficient voice-based E-Mail system that caters specifically to the needs of visually impaired individuals.

In summary, these studies propose innovative solutions to make email more accessible for blind and visually impaired individuals, utilizing various methods such as voice-based input, AI, and speech recognition. While some methods have limitations, they provide a significant step towards making email more accessible for individuals with visual impairments.

PROBLEM DEFINITION

In our mission to overcome the shortcomings of existing email systems, we are dedicated to making users completely independent with our proposed system. We recognize the need to address the challenges faced by individuals with visual impairments or limited literacy abilities, and our aim is to provide a more inclusive and accessible technology experience for everyone.

To achieve this goal, our proposed system focuses on user-friendliness and inclusivity. We have designed the system to rely less on visual cues and more on audio cues, ensuring that individuals with visual impairments can navigate and utilize the system independently. By incorporating voice prompts and feedback, users can interact with the system through spoken commands, reducing the reliance on visual elements.

For individuals who are visually impaired, the ability to use the email system without needing to see the screen is of utmost importance. Our system addresses this need by providing a user interface that leverages audio cues, enabling visually impaired users to perform tasks and access information effectively. By relying on voice prompts, users can compose emails, manage their inbox, and perform various actions without needing to rely on visual feedback.

Furthermore, we understand that literacy limitations can pose a significant barrier to internet usage. To address this challenge, our system incorporates text-to-speech (TTS) technology. This technology converts written text into spoken words, enabling individuals who struggle with reading to access information on the internet. By implementing TTS, our system ensures that users who are illiterate or have limited literacy skills can still benefit from email communication and access relevant information.

The text-to-speech functionality of our system allows users to have emails, web pages, and other textual content read aloud to them. This eliminates the need for individuals who struggle with reading to rely on visual representation alone. By transforming text into spoken words, we provide a more inclusive and accessible experience for users, empowering them to participate fully in the digital world.

In addition to the accessibility features, our proposed system also incorporates robust email functionalities. Users can create new emails, manage their inbox, organize folders, and perform various tasks that are typically expected from an email system. The system utilizes the SMTP (Simple Mail Transfer Protocol) protocol to ensure reliable email delivery and seamless communication between different email clients and servers.

By combining user-friendliness, accessibility, and advanced email features, our system aims to revolutionize the way individuals with visual impairments or literacy limitations interact with email communication. We believe that technology should be inclusive and empower all users to access and utilize digital resources effectively. Through our proposed system, we strive to provide equal opportunities and enable individuals, regardless of their visual or literacy abilities, to communicate, access information, and participate fully in the digital realm.

Furthermore, our system aims to foster independence and self-reliance among users. By reducing the reliance on visual cues and providing voice-based prompts and feedback, individuals with visual impairments can navigate and utilize the email system autonomously. Similarly, users who are illiterate or have limited literacy skills can rely on the text-to-speech technology to access information without requiring extensive reading abilities. This emphasis on independence ensures that users can harness the power of email communication and internet access without facing unnecessary barriers.

In conclusion, our proposed email system goes beyond the limitations of existing systems by prioritizing accessibility and inclusivity. By relying on voice prompts, audio cues, and text-to-speech technology, we provide a user-friendly experience that caters to individuals with visual impairments and limited literacy skills. Through the incorporation of advanced email functionalities and the utilization of the SMTP protocol, our system ensures reliable email communication for all users. We firmly believe that technology should be accessible to everyone, and with our proposed system, we take a significant step towards achieving this vision.

Overall, our proposed system aims to address the limitations of existing technologies and provide a more inclusive technology experience for all individuals, regardless of their abilities. We believe that our system will helpbridge the digital divide and ensure that everyone has equal access to technology and information.

<u>OBJECTIVE OF THE PROJECT</u>

- The project aims at developing an email system that will help even a naive, visually impaired person to use the services without any previous trainings.

- The system will not let the user make use of the keyboard instead will work on the speech recognition. In today's world, much of the communication takes place through internet.

- The proposed work aims to develop a mechanism which converts Speech-to-Text for email composing and also converts Text to speech for the reading emails.

- This application recognizes user voice and performs comparisons with pre-sample voice stored in the database and thus it will execute the voice command.

SCOPE OF THE PROJECT

The development of computer-based accessible solutions has given the blind and visually impaired many new opportunities all around the world. However, because utilizing them involves visual sight, visually impaired persons find it extremely difficult to utilize this equipment. The weaknesses of the current system are remedied by the proposed system. In contrast to the current systems, the proposed approach is voice command anchored. The availability of the suggested system is the most crucial factor that has been taken into consideration. Since the present system is completely different from the one we're designing.

Python is the programming language chosen to implement the requested task of developing an email system with enhanced features and accessibility. The system focuses on providing fundamental functionalities such as creating, reading, transferring, and managing emails, while incorporating voice-based instructions to enhance user experience.

In contrast to existing email systems that prioritize user-friendliness and compatibility, this system takes a step further by emphasizing inclusivity and accessibility. Users are prompted to provide voice commands to interact with the system, enabling a more intuitive and interactive experience. For instance, users can issue commands such as "compose email," "display the email IDs of the three most recent unread messages," or "select email ID" to retrieve specific emails and perform actions.

This direct user-system interaction approach ensures that individuals of varying abilities and backgrounds can effectively utilize the email system. It is designed to accommodate normal users, visually challenged individuals, and even those who may have limited literacy skills. By considering the needs of a diverse user base, this system aims to bridge the accessibility gap and provide equal opportunities for email communication.

The user interface of the system is designed to be intuitive and user-friendly, enabling users to navigate through different email functionalities effortlessly. Through voice-based instructions, users can compose emails, specify recipients, dictate the subject and content, and send messages without relying on traditional keyboard input. This voice input capability greatly benefits visually challenged individuals who may face difficulties in using conventional email systems that heavily rely on visual cues and keyboard shortcuts.

Moreover, the system offers features tailored for visually impaired users. When retrieving emails, the system reads out the topic and content of each email, allowing users to access and comprehend their messages audibly. This Text-to-Speech (TTS) functionality enhances accessibility and enables visually impaired individuals to independently manage their emails without relying solely on visual cues.

Furthermore, the system incorporates advanced functionalities enabled by the SMTP (Simple Mail Transfer Protocol) protocol. SMTP facilitates the seamless transfer of emails between the user's email client and the recipient's mail server, ensuring reliable delivery and efficient communication. By leveraging the capabilities of SMTP, the system provides a robust and dependable email infrastructure, enabling users to send and receive emails seamlessly.

In conclusion, the Python-based email system being developed focuses on enhancing accessibility, inclusivity, and user experience. By incorporating voice-based instructions, it empowers users of all abilities, including normal, visually challenged, and illiterate individuals, to effectively use email communication. The system's intuitive interface, combined with features such as Text-to-Speech and SMTP protocol integration, ensures a user-friendly and reliable email experience for a diverse range of users.

RESEARCH CHALLENGES

- Emailing can be challenging for individuals without the gift of sight, as it interferes with work obligations.

- Audio-based emails are preferred by those without eyes as they can easily reply to spoken commands. However, this type of email system is not always accessible to those who are blind.

- For those without eyes, audio-based email systems can help them understand their location, making it easier to navigate their inbox.

- Traditional email systems require users to remember mouse clicks and keyboard shortcuts, which can be challenging for visually impaired individuals.

- Audio-based email systems prioritize the usability of all users, including those who are typically blind.

- Currently, these systems are only available on desktop computers, but efforts are being made to make them available on smartphones and tablets as well.

- Occasionally, audio-based email systems may have trouble decoding material.

Future updates to the system's user interface may include new functionality to improve reliability and accessibility for visually impaired users.

METHODOLOGY

Voice prompts and click events serve as the fundamental building blocks of the system and are essential for its smooth functioning. This system is designed to prompt the user to perform specific actions, which will enable them to access the required services. The beauty of this system lies in the fact that the user need not use the keyboard extensively. Instead, the mouse click events are the basis for all operations.

The methodology for implementing the voice-based E-Mail system involves several key steps. Firstly, a thorough understanding of the requirements and needs of visually impaired users is essential. This involves conducting user surveys, interviews, and usability tests to gather insights into the challenges they face while accessing and managing email communications.

Once the user requirements are established, the system's design phase begins. This includes creating wireframes and mock-ups to visualize the user interface and determine the layout and placement of voice prompts and click events. Iterative design processes, such as user feedback sessions and usability testing, play a crucial role in refining the system's interface and ensuring its accessibility and ease of use. The next step is the development of the system's core functionalities, such as speech recognition, natural language processing, and text-to-speech conversion. Advanced algorithms and machine learning techniques are employed to achieve accurate voice recognition and seamless interaction between the user and the system. This requires expertise in software development, data processing, and algorithm optimization. Throughout the development process, continuous testing and quality assurance are conducted to identify and fix any bugs or issues that may arise. Both functional and non-functional testing methodologies are employed to ensure the system's reliability, performance, and security.

The implementation of the system involves integrating it with existing email platforms and services. This requires compatibility testing and the development of appropriate APIs and connectors to establish seamless communication between the voice-based system and the email servers. Once the system is fully implemented, a comprehensive evaluation is conducted to assess its effectiveness and usability. This involves conducting user

acceptance testing, where visually impaired individuals are invited to test the system and provide feedback on its performance and accessibility. User feedback is crucial in identifying any areas of improvement and addressing any remaining usability challenges. Furthermore, the system's performance is evaluated in terms of accuracy in voice recognition, speed of response, and overall user satisfaction. This evaluation helps measure the system's success in meeting the initially defined objectives and allows for further enhancements and refinements.

In addition to the technical aspects, it is important to consider ethical and legal considerations in the implementation of the system. Privacy and data protection measures must be implemented to ensure the confidentiality of users' email communications. Compliance with accessibility guidelines and standards, such as the Web Content Accessibility Guidelines (WCAG), should be ensured to provide an inclusive and accessible experience for visually impaired users.

Finally, the findings, insights, and recommendations from the implementation and evaluation stages are documented in a comprehensive report. The report discusses the system's design, development process, challenges faced, and lessons learned. It also highlights the impact and benefits of the voice-based E-Mail system for visually impaired individuals. The report concludes with suggestions for future enhancements and potential areas of research in the field of assistive technologies for individuals with visual impairments. In conclusion, the voice prompt and click event-based system is a convenient and user-friendly system that offers a plethora of benefits to its users. It minimizes the need for keyboard input and makes it easy for visually impaired users to access the system. Additionally, it eliminates the need to remember complex keyboard shortcuts, making it accessible to all types of users, regardless of their level of computer proficiency.

Thus the modules used during the project are as follows:-

• Voice Input.
• MFCC
• Speech to text.
• SMTP Protocol.
• Text to Speech

Voice Input:
Voice input refers to the process of using spoken language as a means of interacting with a computer or electronic device. It allows users to provide commands, dictate text, or control various functions through voice commands instead of traditional input methods like typing or clicking. Voice input technology typically involves voice recognition, which involves converting spoken words into text that can be understood and processed by the system.
MFCC (Mel Frequency Cepstral Coefficients):
Mel Frequency Cepstral Coefficients (MFCC) is a feature extraction technique widely used in speech and audio processing. It aims to capture the essential characteristics of human speech by representing the spectral content of an audio signal. MFCC analyzes the frequency spectrum of the signal and extracts a set of coefficients that are indicative of the underlying speech content. These coefficients are commonly used as features in various applications, such as speech recognition, speaker identification, and speech synthesis.

Speech to Text:
Speech-to-text, also known as automatic speech recognition (ASR) or voice recognition, is the technology that converts spoken language into written text. It involves the analysis and interpretation of audio recordings, identifying individual words or phrases and transcribing them into written form. Speech-to-text technology has numerous applications, including transcription services, voice-controlled assistants, closed captioning, and more. It enables users to communicate through spoken language while generating written text for various purposes.

SMTP Protocol:
SMTP (Simple Mail Transfer Protocol) is a standard communication protocol used for sending and receiving email messages over the internet. It defines the rules and procedures for how email clients and servers interact to deliver messages. SMTP facilitates the transfer of emails between the sender's email client and the recipient's mail server, ensuring reliable delivery and proper handling of email messages across different systems. It is the primary protocol used for email communication and is supported by most email service providers.

Text to Speech:
Text-to-Speech (TTS) is a technology that converts written text into spoken language. It synthesizes natural-sounding speech output, allowing users to listen to written content without relying on visual reading. TTS systems analyze the text, interpret its structure and linguistic elements, and generate corresponding speech output using synthetic voices. TTS technology has a wide range of applications, including screen readers for visually impaired individuals, language learning tools, voice assistants, and audiobook production. It enhances accessibility and enables users to consume written information through auditory   means.
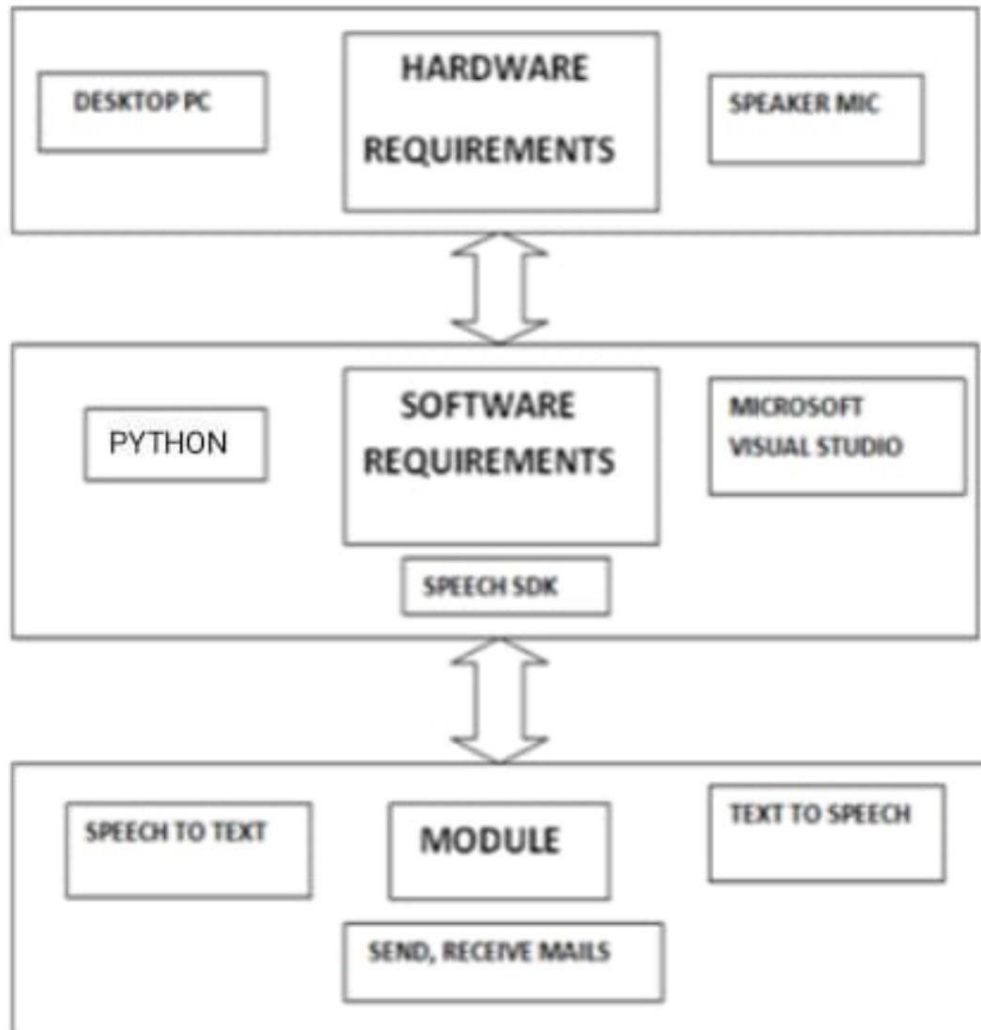
SYSTEM ARCHITECTURE

Thus, the architectural design of the whole project is shown below:-

Fig 1., Overview of the system

Designing of proposed system

The proposed system represents a significant advancement in addressing the disadvantages and limitations associated with existing email systems, particularly those related to screen readers and other accessibility tools. This system introduces a fresh and innovative approach to email communication, with a strong focus on ensuring access to information for users of all abilities.

Unlike the current email systems that primarily prioritize the usability and convenience of typical users, our proposed system aims to cater to the needs of a wide range of individuals, including those with visual impairments and illiteracy. The overarching goal is to create a more inclusive and accessible technology experience that empowers all users to effectively utilize email communication.

One of the key considerations in the development of the suggested system is providing access to information. Recognizing that information accessibility is crucial in today's digital age, our system has been designed to ensure that individuals of diverse abilities can easily access and engage with email content. By incorporating various features and functionalities, we strive to break down barriers and create a technology platform that promotes equal opportunities for all.

In contrast to the present schemes that may overlook the specific needs of visually impaired individuals or those with limited literacy, our proposed system takes a holistic approach, considering the requirements of different user groups. This includes individuals who are visually impaired but otherwise have normal cognitive abilities, as well as those who face challenges due to illiteracy.

To achieve this, our system relies on innovative techniques that go beyond the traditional approaches used in email systems. By integrating voice-based interactions, users, including those with visual impairments, can easily navigate through the system and perform various tasks. The system prompts users with voice instructions, enabling them to compose emails, read and manage their inbox, and interact with different features using spoken commands. This approach reduces reliance on visual cues and provides a more inclusive user experience.

Moreover, the proposed system incorporates text-to-speech (TTS) technology, which is a pivotal aspect of enabling accessibility for individuals with limited literacy skills. TTS converts written text into spoken words, allowing users to listen to the content rather than relying solely on reading. This feature is particularly beneficial for users who may struggle with reading, such as those with illiteracy. By integrating TTS, our system ensures that users who face literacy challenges can still access and engage with email content effectively.

By adopting a user-centric approach, our proposed system aims to address the needs of individuals with diverse abilities and backgrounds. We understand that the requirements of visually impaired individuals, illiterate individuals, and other user groups may vary significantly, and our system is designed to cater to these specific needs.

In addition to addressing accessibility challenges, our proposed system also takes into account the overall usability and functionality expected from an email system. Users can create new emails, manage their inbox, organize folders, and perform other standard email-related tasks. The system leverages the SMTP (Simple Mail Transfer Protocol) protocol, which ensures reliable email delivery and seamless communication between different email clients and servers.

In conclusion, the proposed email system represents a significant departure from existing approaches by emphasizing accessibility, inclusivity, and information access. By focusing on the needs of individuals with visual impairments and limited literacy skills, our system provides a new concept in email communication. Through the integration of voice-based interactions, TTS technology, and standard email functionalities, our system offers a user-friendly experience that caters to all individuals, regardless of their abilities or background. By eliminating barriers and providing equal opportunities for engagement, we strive to foster a more inclusive digital environment.
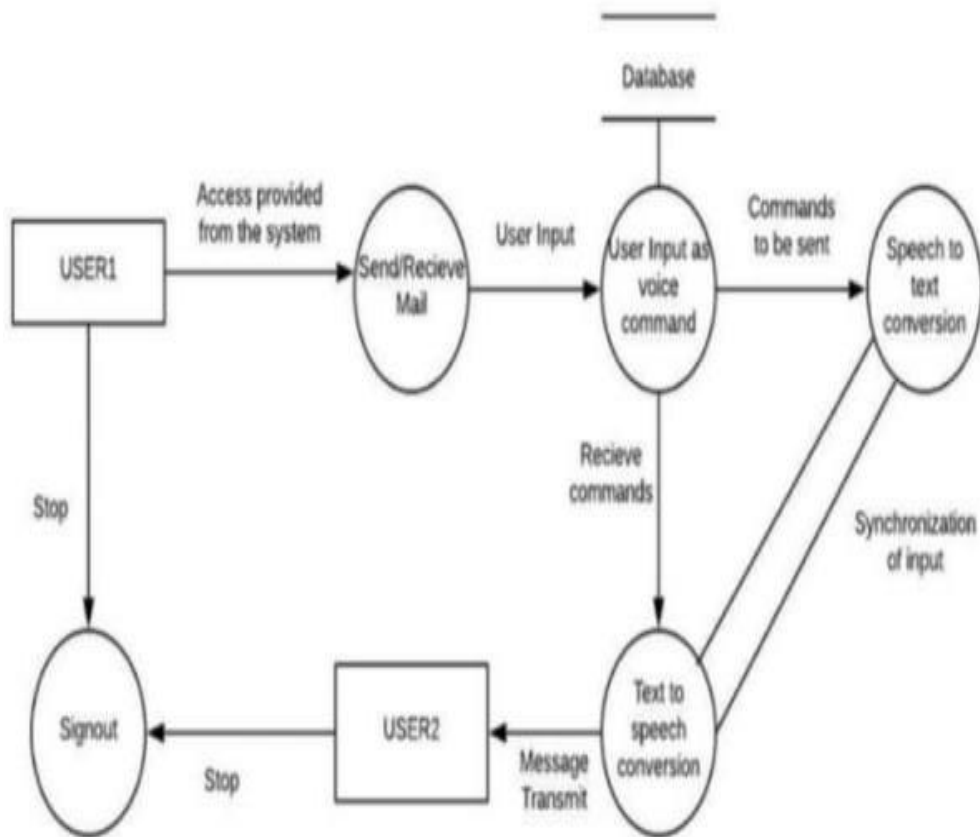
Fig 2., Voice Based Email System

FLOWCHART
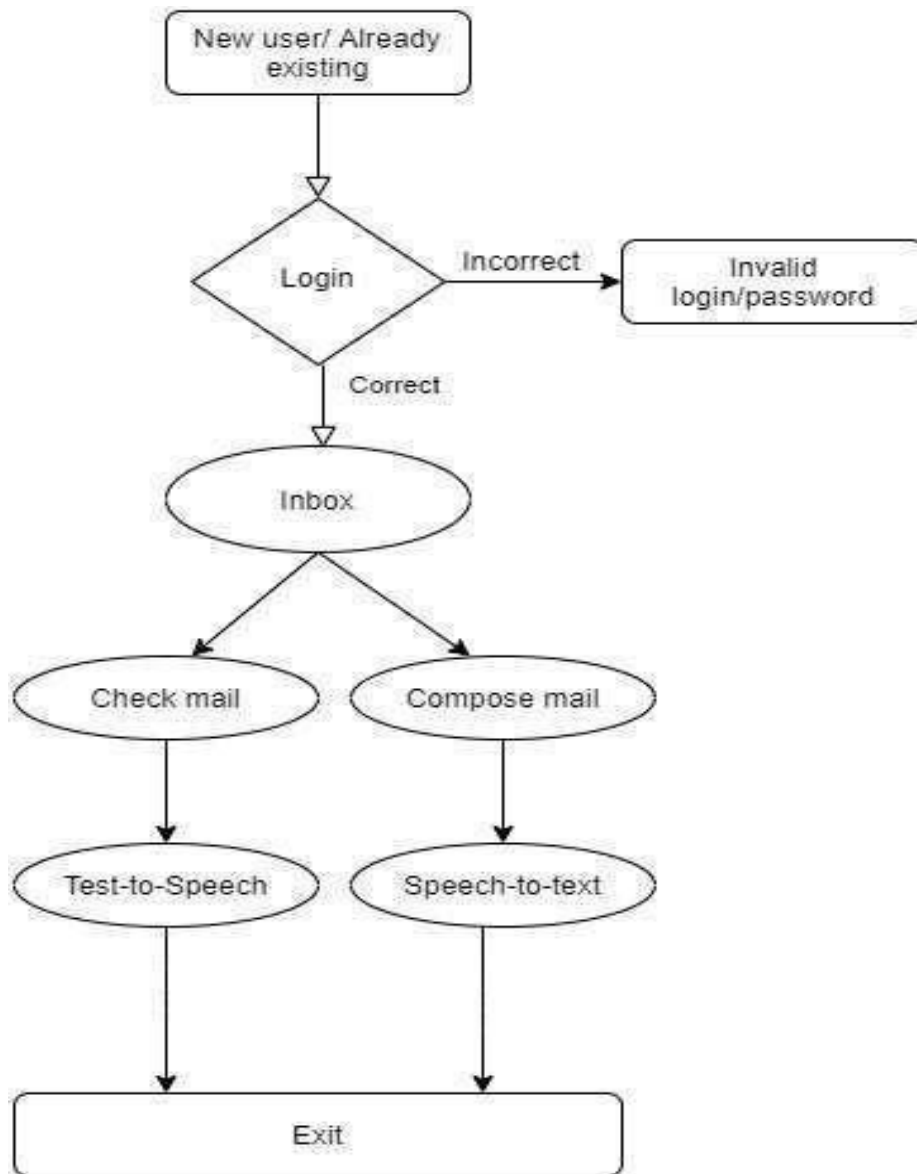
Fig 3. Flowchart

This figure explains the flow of the application:

- The user has to register themselves by creating their account.

- It will prompt for Email id and Password, following which, the authentication will take place.

- For correct credentials entered the user's registration process will be successfully completed.

- The user can log into their mail systems, Check Mails and compose them.

- Here, the Speech-to-text & Text-to-speech modules

- Come handy.

- System reads out mails, the sender's name, the subject and the main body.

- Similarly, users can compose emails with the help of the Speech Recognition module or directly send audio attachments with the recorder provided by the application

REQUIREMENTS

Functional requirements consist of two types. Those are software and hardware requirements

1. Software Requirement

Software Requirements are:
  Python:

   i. Version: 3.11 version
   ii Requirements: Windows (All Versions), Linux
   iii. Languages: Multiple languages
   iv. License: Open Source
   v. Packages: pyttsx3, smtplib, playsound (version 1.2.2), PyAudio

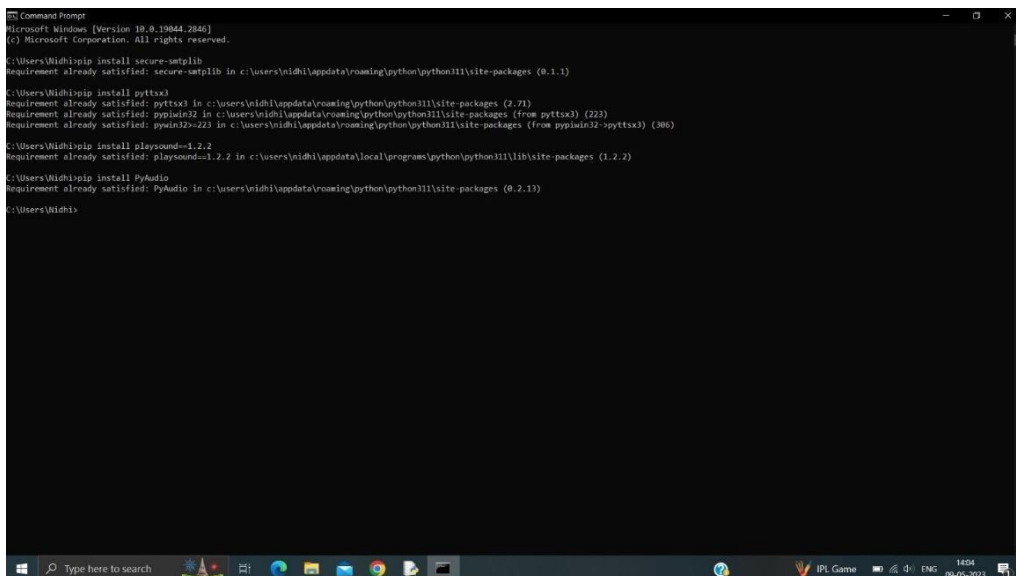## 2. Hardware Requirement

Hardware Requirements are:
   Mouse
   Headphone with microphone jack

RESULT AND ANALYSIS

If the user is using this application for the first time, they must register so that the google automatically retrieves mail from the user account. The registration page is as follows. The registration is mandatory for all the users to ensure that they have an email account so that the mail communication will be possible. After registration, the page directs to the main user interface. The below images shows that on user saying email to the application the mail module starts executing.

The libraries used during this project are mentioned below:

Fig 4., Installed Libraries

1. Pyttsx3 module is a text-to-speech conversion library in python. Unlike alternative libraries, it works offline and is compatible with both languages python 2 and 3.

2. PyAudio module provides Python buildings for PortAudio v19, the cross-platform audio I/O libraries. With this we can easily use Python to play and record on a variety of platforms.

3. Playsound module contains only one thing- the function playsound. It is a cross platform, single function module with no dependencies for playing sounds.

4. Smtplib module defines an SMTP client session object that can be used to send mail to any internet machine with an SMTP or ESMTP listener daemon.

5. Speech Recognisition module is a machine's ability to listen to spoken words ans identify them. In python we can use ro convert the spoken words in text, make a query or a reply.

6. Easyimap module is used for accessing emials over imap protocol.

7. Pip in Python is a package manager for Python pacakges, or modules if you like.

1. Libraries used by the system

The propose system speech_recognition package from python library which is installed using the pip command. Speech Recognition it is an important feature in several day- to-day application used in home application and many artificial intelligence etc. Pythons client side library called imaplib is used for accessing emails over IMAP protocol. It allows the client program to manipulate the email message.

2. Speech to Text -Proposed approach

Speech recognition includes the technology and linguistic to identify the spoken words by the user and converts them into text. It helps the computer to understand the human language. The speech recognizer in python is used to convert the spoken words into text and make a query and reply them with the required functions.

3. Text to Speech -Proposed approach

The proposed model converts human language text into human like speech. Python provides many application interface to do the same. The Google Text to Speech is one the most efficient method and this API is used in our system. It is very easy to use the tool and provides many built in function which is utilized to save the text.

4. To send and receive Mails

The library used in the proposed system is email and imaplib from python library. Email is pythons built in smtp library which is used to send basic

emails. IMAP is an email retrieval protocol which saves the storage space by not downloading the mail. It helps to read the inbox message and displays them. This package is very helpful in low bandwidth. IMAP provides various functions like deleting,reading,replying and many more.

In our module we utilize the read function.

5. Result And Performance Analysis

The proposed method for voice based email system when compared to some pre exitising model has very few disadvantages. But the system has many advantages that is it allows the user to filter the contents from the mail and allows the user to choose the mail id from which the contents can be read. Its effective with imple microphone available in the personal computers.
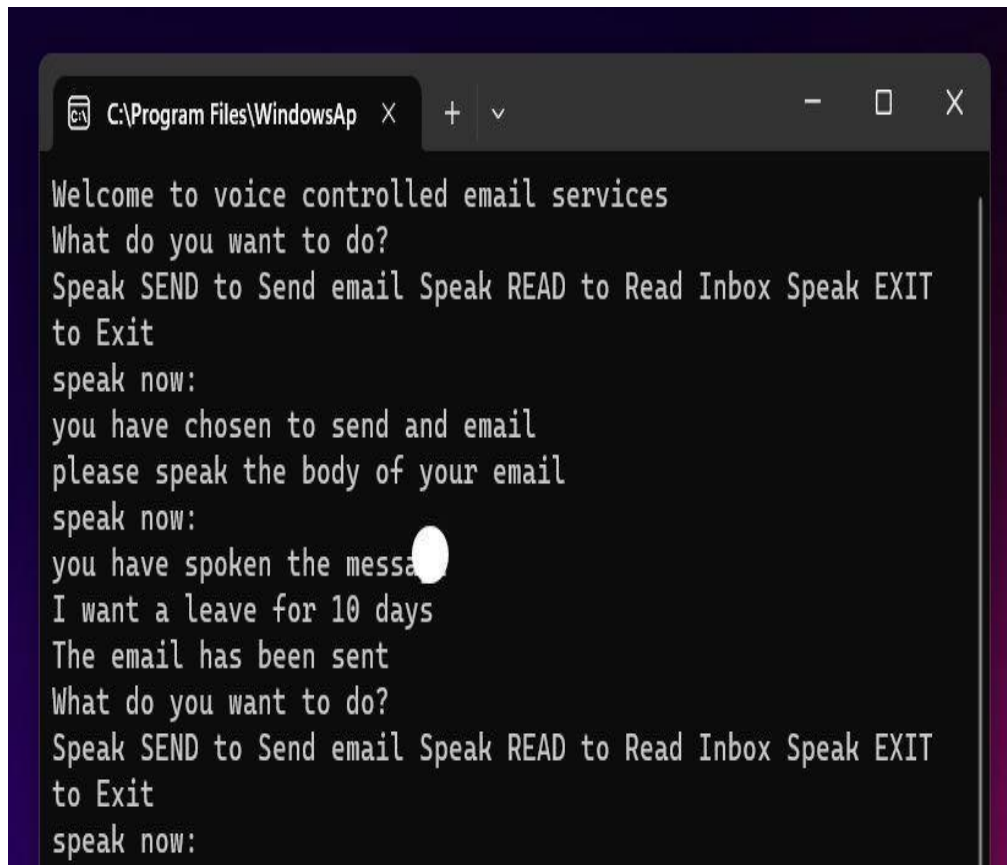
This is the final result of the model done.

Fig 5., Result

As this window clearly shows that we will be seeing a welcome note at the top of the page and the message generated by the system. Then step by step all the functionalities will be working as per the requirements of the user i.e., visually impaired one.

1. Speak
2. Read
3. Exit and so on.

DISCUSSION

However, the application fails to work as expected in the following cases:

1. If the system does not support the specified version of Python used for this application.
2. If the system's speaker or earphones are not working properly.
3. If wrong credentials are provided

GENERAL CONSTRAINTS

• Required packages need to be installed in the system with the mentioned version of Python.
• All audio files should be present in the system.
• A proper headphone is to be used with a working microphone.
• Detachable mouse is required.

CONCLUSION

This e-mail system is a revolutionary innovation that aims to address the needs of visually challenged individuals while providing a user-friendly interface suitable for people of all ages. By eliminating the dependence on keyboard shortcuts and incorporating a screen reader, this system overcomes the significant obstacles that visually challenged people often encounter when accessing emails.

In the past, visually challenged individuals faced numerous challenges when using traditional email systems. They struggled with navigating through complex keyboard shortcuts, which required a level of visual acuity that they lacked. Additionally, screen readers were often incompatible or insufficiently effective in interpreting email interfaces, limiting accessibility and usability for visually impaired users. These issues created a significant barrier for visually challenged individuals, impeding their ability to communicate effectively via email.

However, with the introduction of this innovative email system, these barriers have been eliminated, empowering visually challenged individuals to overcome their challenges and participate fully in email communication. The system incorporates a voice recognition program that provides an efficient and intuitive voice input technique specifically designed for blind individuals using mailing devices. By leveraging voice commands, visually challenged users can effortlessly compose, send, and manage their emails, making the entire process more accessible and convenient.

Moreover, this system also benefits uneducated and handicapped individuals who may face challenges in operating traditional email interfaces. Thanks to the implementation of Text-to-Speech (TTS) and Speech-to-Text (STT) technologies, these individuals can utilize the voice-based email system to communicate and interact with others effectively. TTS technology enables the system to read aloud incoming emails, ensuring that users can access and comprehend their messages without relying on written text. Conversely, STT technology allows users to dictate their responses, which are then converted into text and sent as emails. This integration of TTS and STT technologies provides a comprehensive solution that caters to the diverse needs of both visually challenged and uneducated individuals, making email communication more inclusive and accessible.

To provide readers with a broader understanding of these emerging technologies, the email system's documentation or informational page includes a comprehensive overview of various research projects and their associated technologies. The page highlights the advantages and disadvantages of each technology, offering readers insights into the different approaches and methodologies employed in this field. By presenting this synopsis, the system aims to foster awareness and understanding of the advancements being made in assistive technologies, encouraging further exploration and innovation.

In conclusion, this e-mail system represents a significant advancement in making email communication accessible to visually challenged individuals. By eliminating the reliance on keyboard shortcuts and incorporating a voice recognition program, it empowers visually impaired users to overcome the challenges they face when accessing and using traditional email systems. Additionally, the integration of TTS and STT technologies extends the benefits to uneducated and handicapped individuals, enhancing inclusivity and enabling a broader range of users to participate in email communication. Through its documentation and informational page, the system also promotes awareness and understanding of assistive technologies, fostering continued progress in this field.

CONTRIBUTION

Enrollment No.	Name	Work
UU1901010039	Nidhi Dhiman	Recording the speech from the user (speak and listen) and importing libraries, Research
UU1901010032	Kavita Gaira	Documentation and functionality (processing the input)
UU1901010008	Ajay Mridha	Documentation and functionality (sending & reading the mail)
UU1901010011	Aman Kumar	Conditions and error handling

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