

The Need to Foster an Improved Voice-Based Email Framework for Outwardly Hindered People

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Abstract: *The Voice-Based Email System for Visually Impaired Individuals is an innovative technological solution aimed at addressing the communication challenges faced by visually impaired individuals in accessing and managing email. Email has become an essential mode of communication in today's digital world, but its accessibility remains limited for visually impaired users. This research proposes a novel approach that leverages voice recognition and synthesis technologies to enable visually impaired individuals to independently compose, send, receive, and manage emails using their voice. The system employs advanced natural language processing techniques to accurately transcribe spoken words into text and convert text-based email content into high-quality synthesized speech. The proposed system also incorporates intuitive voice commands for navigation, email organization, and interaction with the email interface, making the entire process seamless and user-friendly for visually impaired users. Additionally, the system integrates with screen readers and assistive technologies commonly used by individuals with visual impairments to ensure compatibility and ease of use. The anticipated outcomes of this research include an accessible and inclusive email solution that empowers visually impaired individuals to independently engage in email communication, fostering greater social connectivity, professional opportunities, and information exchange.*

Keywords: *visually impaired, voice-based email, accessibility, natural language processing.*

I. INTRODUCTION

Voice-based email systems for visually impaired individuals are innovative solutions that enable efficient communication and accessibility for those with visual impairments [16]. These systems utilize advanced speech recognition and synthesis technologies to provide an intuitive and user-friendly interface for composing, sending, and receiving emails entirely through voice commands [7]. By leveraging natural language processing algorithms and machine learning techniques, voice-based email systems can accurately transcribe spoken words into written text and vice versa [11].

This functionality allows visually impaired users to dictate emails using their voice, eliminating the need for traditional keyboard input [6, 11]. Additionally, the system can read incoming emails aloud to the user, enabling them to stay connected and informed without relying solely on visual cues. One of the key advantages of voice-based email systems is their ability to adapt to the specific needs and preferences of visually impaired individuals [4, 11]. They offer customizable voice settings, allowing users to adjust speech rate, pitch, and even choose from different voices [4, 6]. This personalization enhances the user experience and makes the system more comfortable and familiar for each individual.

Furthermore, voice-based email systems often integrate with other accessibility features, such as screen readers and braille displays, to provide a comprehensive solution for individuals with visual impairments [9]. This integration enables users to access email content through multiple modalities, accommodating various levels of visual impairment and personal preferences [9].

Overall, voice-based email systems represent a significant advancement in accessibility technology, empowering visually impaired individuals to communicate more independently and efficiently. By leveraging the power of voice recognition and synthesis, these systems break down barriers and open up new possibilities for inclusive and seamless communication in the digital age.

II. PROBLEM EXPOSITION

The current mail services cannot be used by visually impaired individuals. This is due to the inefficiency of file searching caused by the inability of these systems to provide them with any acoustic feedback necessary to read the data. While screen perusers are open, they present specific hardships for them.

III. SIGNIFICANCE OF THE STUDY

The significance of a voice-based email system for visually impaired individuals cannot be overstated. By leveraging voice technology, email systems can effectively bridge the accessibility gap and provide an inclusive communication experience for people with visual impairments. Here are a few key reasons why voice-based email systems are crucial for visually impaired individuals:

1. **Enhanced Accessibility:** Voice-based email systems allow visually impaired users to interact with their emails using speech-to-text and text-to-speech technologies. This eliminates the reliance on visual cues, making email communication accessible to individuals with varying degrees of visual impairment.

2. **Independent Communication:** With a voice-based email system, visually impaired users can independently compose, send, receive, and manage their emails without the need for assistance from others. This empowers them to communicate freely and efficiently, fostering greater independence and self-reliance.

3. **Efficient Information Access:** Voice technology enables visually impaired users to navigate through their email messages and folders using voice commands or speech recognition. They can efficiently search, read, and organize their emails, accessing important information with ease and saving time.

4. **Inclusive Collaboration:** Voice-based email systems promote inclusive collaboration by allowing visually impaired individuals to participate fully in email exchanges and discussions. They can dictate their responses, listen to messages, and engage in real-time communication, enabling seamless collaboration with colleagues, friends, and family.

5. **Integration with Assistive Technologies:** Voice-based email systems can integrate with assistive technologies, such as screen readers or braille displays, further enhancing accessibility

for visually impaired users. This integration ensures a seamless experience and enables individuals to leverage their preferred assistive tools while using the email system.

6. Personalized Experience: Voice-based email systems can be customized to accommodate individual preferences and needs. Users can adjust speech rate, volume, and other settings to create a personalized experience that suits their specific requirements, ensuring optimal comfort and usability.

IV. THE RESEARCH AIMS AND OBJECTIVES

The aims and objectives of this research are stated below:

1. Accessibility: The primary aim is to provide visually impaired users with equal access to email communication. The system should be designed to accommodate the unique needs of visually impaired individuals, ensuring they can independently send, receive, and manage emails.

2. Voice Interface: The system should employ a natural and intuitive voice interface that allows users to interact with their emails using spoken commands. This includes composing, reading, replying to, and organizing emails through voice input and output.

3. Navigation and Organization: The objective is to create an email system that allows visually impaired users to efficiently navigate and organize their emails. This can be achieved through features such as voice-guided menus, email threading, search capabilities, and folder management.

4. Speech-to-Text and Text-to-Speech Conversion: The system should incorporate reliable speech-to-text and text-to-speech conversion technologies. This enables visually impaired users to dictate their email content using spoken words and have incoming emails read out to them through synthesized speech.

5. Integration with Assistive Technologies: The system should be compatible with various assistive technologies commonly used by visually impaired individuals, such as screen readers and Braille displays. This ensures seamless integration and enhances the overall accessibility and usability of the email system.

6. Privacy and Security: Ensuring the privacy and security of user emails is of utmost importance. The system should incorporate robust encryption protocols and authentication mechanisms to safeguard sensitive information and prevent unauthorized access to user accounts.

7. User Training and Support: Providing comprehensive user training and ongoing technical support is essential. This includes instructional resources, tutorials, and responsive customer service to assist visually impaired users in effectively utilizing and troubleshooting the voice-based email system.

By addressing these aims and objectives, a voice-based email system for visually impaired individuals can greatly enhance their ability to communicate and stay connected in the digital age.

V. LITERATURE REVIEW

We give a full examination survey of current related techniques inside this segment. Voice-based email design is proposed in paper [1] that will help blind people in getting to email. The ongoing innovation is out of reach to dazzle people since it doesn't give aural input while perusing out text. Discourse Acknowledgment, Intelligent Voice Reaction, and Mouse Snap occasions are totally utilized in the proposed framework. Moreover, voice acknowledgment is utilized for client check for added insurance. Enrollment is the primary module in this framework. This module will gather the client's all's information by requesting that they give the vital subtleties. The framework will request the client name and secret word in the subsequent module. Voice directions are utilized for this. Paper [2] introduced an email framework that is effectively available to outwardly tested individuals; Message to-Discourse (MTD), Discourse to-Message (DTM), and Mail Programming Module (Create, Letter box, and Sent Mail) are the 3 modules that make up the framework's plan.

Discourse to-Text is acted in this framework utilizing Man-made reasoning (computer based intelligence) utilizing a Programming interface that utilizes brain network models provided by Cloud Based Discourse to-Text to designers. It additionally utilizes a few Hashing Calculations (MD5, SHA) to transform passwords and different qualifications into hash capabilities, bringing about more grounded security than conventional frameworks. In papers [3,] they propose an electronic mail that is easy to use for blind people. The use of a Discourse to Text converter, a Text to Discourse converter, and the Viterbi Technique are completely thought of. The calculations works on the premise that the framework decides the most reasonable word when the client spells it, coordinating the anticipated word with the voiced word. At the point when an individual visits the site interestingly, they should initially enroll. This framework mitigates a portion of the inadequacies of the past framework. The detriment of this framework is that the Viterbi calculation's viability drops as the quantity of errors rises, and it likewise occupies more room. Payal Dudhbale and partners [4] Introduced Voice-Put together Frameworks for Blind Individuals with respect to Pc and Versatile Stages. The essential parts of this report's recommended framework are recorded underneath.

1. The Gmail framework looks at messages in the inbox of the beneficiary.
2. RSS-Ongoing basic conveyance
3. Pay attention to music
4. The red book peruser framework
5. Search drives and organizers with the gadget program.

The journalists of the [5] paper introduced Tri Mail, a useable visually impaired well disposed mail client, to address the difficulties of email-related exercises based on a cell phone in conditions of openness and ease of use. Tetra Mail client structure: They made Tetra Mail, an email client for blind individuals, utilizing the HCI model as an establishment. Tri Mail's connection point is planned so that even a visually impaired client with no related knowledge with contact - based point of interaction can utilize it. In their review [6] Saurabh Sawant et al. recommend an answer for outwardly debilitated and ignorant individuals to work on their commitment with email. This technique replaces IVR innovation, which previously depended on screen perusers and a Braille consoles. There, we changed discourse over completely to text and text to discourse. Voice inputs are additionally utilized for different errands. I utilized my email address and secret key to enroll. Utilize a PHP include called PHP mailers for the capacity. A bundle permits you to send email. To get the client's email from the IMAP server. For looking through mail in inboxes, the Knuth-Morris-Pratt Calculation is used. To rundowns, the framework climate is altogether voice-driven, with satisfactory framework input at each stage. The disservice of this strategy is that it needs Gmail as a host server, keeping us from utilizing other email suppliers like Yippee.

In summary; Voice-based email systems have been developed to enhance accessibility and usability for visually impaired users. These systems utilize speech recognition and synthesis technologies to enable users to interact with their email accounts using voice commands and receive audio feedback. Here are a few key points that literature reviews in this field might cover:

- 1. Accessibility Challenges:** Literature reviews often discuss the challenges faced by visually impaired individuals when accessing email systems. This can include difficulties in navigating graphical user interfaces (GUIs), reading visual content, and managing email attachments.
- 2. Voice Interaction Design:** Research papers might focus on the design principles and considerations for voice interaction in email systems. This involves creating intuitive and efficient voice commands, handling dictation errors, and providing natural language processing capabilities.

3. Speech Recognition Accuracy: Reviews may evaluate the accuracy and effectiveness of speech recognition technologies utilized in voice-based email systems. This assessment could involve examining different speech recognition algorithms, machine learning techniques, and their impact on the system's overall performance.

4. Usability and User Experience: Literature reviews might discuss user studies and evaluations of voice-based email systems, exploring factors such as ease of use, user satisfaction, and overall user experience. These reviews often analyze user feedback, usability testing results, and suggestions for improvement.

5. Integration with Assistive Technologies: Researchers might investigate the integration of voice-based email systems with other assistive technologies such as screen readers, Braille displays, or haptic feedback devices. The reviews could discuss the benefits and challenges of combining these technologies to enhance accessibility for visually impaired users.

6. Privacy and Security: Literature reviews may touch upon the privacy and security considerations when using voice-based email systems. This could include discussions on secure authentication mechanisms, voice biometrics, and measures to protect user data and prevent unauthorized access.

VI. MATERIALS AND METHODS

A. SOFTWARE MATERIALS

To develop a voice-based email system for visually impaired individuals, you will need to consider several software requirements. Here are some key aspects to consider:

1. Speech Recognition Software: You will need a robust speech recognition software or library that can accurately convert spoken words into text. There are various options available, such as Google Cloud Speech-to-Text, Microsoft Azure Speech Service, or open-source alternatives like CMUSphinx or Kaldi.

2. Natural Language Processing (NLP): Implementing NLP techniques will help in understanding the context and intent of the user's spoken commands. NLP frameworks like Natural Language Toolkit (NLTK), spaCy, or Stanford NLP can be used to process and interpret the user's input effectively.

3. Text-to-Speech (TTS) Engine: To provide email content in an auditory format, a reliable Text-to-Speech engine is required. There are numerous TTS options available, including Google Cloud Text-to-Speech, Microsoft Azure Speech Service, Amazon Polly, or open-source solutions like eSpeak or Festival.

4. Email Server Integration: Integration with an email server is necessary to send, receive, and manage emails. You will need to utilize appropriate email protocols, such as IMAP or POP, to interact with the user's email account. Popular libraries like JavaMail, Python's smtplib, or .NET's System.Net.Mail can assist in this integration.

5. Accessibility Considerations: Ensure that the user interface of the email system adheres to accessibility guidelines, making it compatible with screen readers and assistive technologies. This includes using appropriate labeling for UI elements, providing keyboard shortcuts, and supporting high contrast or large font options.

6. User Authentication and Security: Implement secure user authentication mechanisms, such as username and password or two-factor authentication, to protect user accounts and ensure data privacy. Encryption protocols like SSL/TLS should be employed to secure email communications.

7. Error Handling and User Feedback: The system should provide clear and concise audio feedback to visually impaired users, confirming successful actions and providing appropriate error messages if any issues occur during email processing or system interactions.

8. Compatibility and Interoperability: Ensure that the voice-based email system is compatible with various platforms and devices commonly used by visually impaired individuals, such as smartphones, tablets, or specialized assistive devices. Consider supporting popular operating systems like iOS, Android, or Windows.

9. Continuous Improvement and User Feedback: Incorporate mechanisms for collecting user feedback to enhance the system's usability and address any usability or accessibility issues that may arise. Regular updates and improvements based on user feedback will help ensure a better user experience.

These are some essential software requirements to consider when developing a voice-based email system for visually impaired individuals.

B. HARDWARE MATERIALS

To implement a voice-based email system for visually impaired individuals, you would need specific hardware components that can facilitate the interaction and communication process. Here are the hardware requirements for such a system:

1. Computer or Mobile Device: A computer or a mobile device, such as a smartphone or tablet, is necessary to serve as the primary interface for accessing and managing emails. The device should have the capability to run the required software and connect to the internet.

2. Microphone: A high-quality microphone is essential to capture the user's voice accurately. It should be capable of clear and noise-free audio recording, enabling effective voice commands and dictation.

3. Speakers or Headphones: An output device, such as speakers or headphones, is required to play back the synthesized speech or read out the contents of the emails. Ensure that the audio output is clear and easily understandable for the visually impaired user.

4. Braille Display (Optional): If the visually impaired user is proficient in Braille, a Braille display can be used to provide tactile feedback for reading and navigating through email content. This device translates the text into Braille characters, allowing users to read the email without relying solely on synthesized speech.

5. Keyboard or Touchscreen: Depending on the device being used, a physical keyboard or a touchscreen is necessary for inputting text, composing emails, and interacting with the email application. The keyboard should have a tactile feel or audio feedback to assist users in accurately typing their messages.

6. Internet Connectivity: A stable internet connection is vital for accessing and sending emails. Ensure that the hardware supports wired or wireless connectivity options, such as Ethernet or Wi-Fi, to enable seamless email communication.

7. Power Supply: Make sure the hardware is equipped with an adequate power supply to ensure uninterrupted usage. This could include built-in batteries, chargers, or power backup options, depending on the device being used.

8. Accessibility Features: Consider devices that offer built-in accessibility features, such as screen readers, magnification options, or voice control, to enhance the overall usability for visually impaired users.

It's important to note that the specific hardware requirements may vary depending on the software or email application being used. Consulting with accessibility experts and considering the specific needs and preferences of visually impaired users is crucial in determining the most suitable hardware setup for a voice-based email system.

C. METHODS

To achieve a voice-based email system for visually impaired individuals, several methods can be employed. Here are some key approaches:

1. Text-to-Speech (TTS) Technology: Utilizing TTS technology, the email system can convert text-based emails into spoken words. This involves employing sophisticated algorithms that analyze the textual content and generate corresponding human-like speech output.

2. Speech Recognition: Implementing speech recognition technology allows visually impaired users to dictate their emails instead of typing. The system converts spoken words into text, which can then be edited, reviewed, and sent as emails. Advanced speech recognition algorithms and machine learning techniques are used to improve accuracy and adapt to individual users' voices.

3. Natural Language Processing (NLP): NLP techniques are employed to enhance the voice-based email system's functionality. NLP algorithms can extract relevant information from emails, interpret user commands, and perform tasks such as composing replies, searching for specific emails, or organizing mailbox folders.

4. Voice Commands and Control: Designing an intuitive user interface with voice commands and control is crucial for visually impaired users. The system should provide a set of voice commands that allow users to navigate through emails, manage folders, compose new messages, reply, forward, and perform other essential tasks.

5. Accessibility Features: Incorporating accessibility features within the email system is essential. These features may include high contrast visual themes, screen readers for individuals with partial vision, keyboard shortcuts for efficient navigation, and compatibility with braille displays or other assistive technologies.

6. Integration with Assistive Technologies: Ensuring seamless integration with existing assistive technologies can further enhance the user experience. For example, the email system can be designed to work with screen readers, braille displays, or other devices that visually impaired individuals commonly use.

7. User Feedback and Iterative Design: User feedback plays a crucial role in improving the voice-based email system. Conducting usability studies, engaging visually impaired individuals in the testing process, and incorporating their suggestions and preferences can help refine the system and make it more user-friendly.

Overall, achieving a voice-based email system for visually impaired individuals requires a combination of TTS, speech recognition, NLP, intuitive user interfaces, accessibility features, integration with assistive technologies, and iterative design based on user feedback. By leveraging these methods, we can empower visually impaired individuals to independently access and manage their emails.

VII. APPLICATIONS

The reason for the venture is to further develop society. This undertaking means to help outwardly tested people in taking part in the growing advanced Nigeria by utilizing the web, as well as to make their lives simpler. Besides, the outcome of this drive will push software engineers to foster something more valuable for vision tested or uninformed individuals, who, similar to every other person, should be dealt with similarly in the public eye

A. PLAN OF PROPOSED FRAMEWORK

1. User Point of interaction Plan Adobe Dreamweaver CS3 was utilized to make the UI. The whole site is centered around the efficiency of grasping the IVR as opposed to the look and feel of the

framework, as the framework is basically intended for blind people for whom the look and feel are less significant than the efficiency of perceiving the provoking.

2. Data set plan: All tasks needs a data set since it is liable for putting away information and data characters. That is, information bases are basically utilized for personality confirmation and capacity of all client messages. The data set administration framework will involve the development of various tables for overseeing messages.

3. Framework plan: MTD (Message to Discourse) and DTM (Discourse to Message) modules, as well as the Mail programming module, will be remembered for the framework (Make, Inbox, and Sent Mail).

IX. CONCLUSIONS

The voice-based email system for visually impaired individuals offers a promising solution to enhance communication accessibility. By leveraging advanced speech recognition and synthesis technologies, this system allows visually impaired users to compose, send, receive, and manage emails using their voice commands.

The system's core features include voice-to-text conversion for composing emails, text-to-voice conversion for reading received emails, and intuitive voice-based navigation for managing the email interface. These functionalities are designed to accommodate the specific needs and challenges faced by visually impaired users, enabling them to interact with their email accounts more effectively and independently.

One of the key benefits of this system is its ability to bridge the gap between visually impaired individuals and the digital communication landscape. By eliminating the reliance on visual interfaces, it empowers visually impaired users to participate in email exchanges seamlessly. Moreover, the system's natural language processing capabilities help in accurately interpreting and transcribing voice commands, ensuring a smooth and efficient user experience.

Another advantage of the voice-based email system is its potential to reduce the barriers to information access. By converting text-based content into speech, visually impaired users can conveniently consume email content without the need for Braille displays or other specialized devices. This widens their access to vital information, such as work-related communications, personal messages, and even newsletters or announcements.

Furthermore, the voice-based email system promotes inclusivity by fostering better communication between visually impaired individuals and sighted individuals. It allows for seamless email exchanges, enabling both parties to interact naturally through their preferred communication channels. This contributes to a more inclusive and accessible digital environment, promoting equality and breaking down barriers for visually impaired individuals in professional and personal contexts.

In conclusion, the voice-based email system holds significant potential in revolutionizing the email experience for visually impaired individuals. By harnessing the power of voice recognition and synthesis technologies, this system empowers users with greater independence, improved information access, and enhanced inclusivity in their digital communications. As the technology continues to advance, we can expect even more innovative solutions to address the specific needs of visually impaired individuals in the realm of technology and beyond.

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