

An Application of Voice Mail: Email Services for Visually Impaired

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Abstract— Advancements in technology have paved the way for innovative solutions that bridge accessibility gaps for individuals with visual impairments. This paper presents a pioneering system, designed to empower visually impaired users in accessing, composing, and managing email messages with attachments using spoken language. Through seamless integration with popular email services, the application empowers users to navigate their inbox, access attachments, and stay connected in the digital realm. By bridging the gap between the visually impaired and email communication, this solution showcases the transformative capacity of technology in nurturing inclusivity and empowering greater independence. This paper explores the conceptualization, development, and implications of this voice-driven application, underscoring its role in enabling a more connected and participatory experience for individuals with visual impairments.

Index Terms— Android Application, Email, Visually Impaired, Speech to Text, Text-Speech, Voice-based E-Mail.

I. INTRODUCTION

The mail services that are used by common people in their day-to-day life cannot be used by blind people. We came up with this project to ensure that these systems are convenient for visually challenged people. There are many technologies that are not useful for visually impaired people as they cannot respond in special way that they can understand hence it is very inconvenient for them to use such a system [1]. The objective of Voice Based Email Services for Visually Impaired is to help visually challenge people to access mails easily and efficiently in a problem free manner. This mobile application is completely based on speech-to-text and text-to-speech. Hence it enables everyone to efficiently use their mail completely by their voice only to read the mail, send the mail, and perform all the other tasks required in the mailing system.

To perform any action the system will request the user to give voice command and the system will ask the voice command through voice only. So here Speech-to-Text and Text-to-Speech technologies have been used. The Speech-to-Text is also called as Automatic Speech Recognition, which converts the voice that is said into text, where the user gets help while composing emails. The Text- to-Speech is all about converting text into an audio output, where it reads out the mail that is received, the sender, subject and the body of the mail and if it is important it goes to important mail that is read out by the system. The main aim of our project is to provide a very effective and efficient assistance for the visually impaired people use applications like mail in mobile phones. This method

of providing assistance to individuals in a method of tedious and furthermore ideal message willing to be gotten [2]. This application is a client framework collaboration wherein the framework connects with the client like it requests that the client enter the message and the entered message is shown and furthermore the framework additionally requests to enter the beneficiary mail id and afterward it sends when we say to send the message. The voice Activation Detection API is utilized to change our sound into a message. The framework likewise talks i.e., reaction to client as needs to be.

Emails received by visually impaired users are processed by an automated system that converts the text content into speech. Advanced text-to-speech (TTS) technology can be employed to ensure natural and clear audio output. Users can interact with their emails using voice commands. They can instruct the system to read specific emails, reply to messages, mark emails as important, delete spam, and perform other tasks through spoken instructions[3]. In addition to reading emails, the system can support voice recognition for composing new emails. Users can dictate their messages, and the system converts their spoken words into text for sending. The voice mail-based email service can be integrated with other assistive technologies such as screen readers and Braille displays to offer a comprehensive solution for visually impaired users [4].

The current framework utilizes chiefly three kind of advancements like STT (Speech to Text): here anything we talk will be switched over completely to message, TTS (Text to Speech): this is inverse of STT technique, here the message composed on the screen will be perused by the framework and IVR (Interactive Voice Response) IVR is a trend setting innovation depicts the cooperation between the client and the framework in the approach to answering by involving console for the separate voice message. Additionally, mouse click occasions are utilized for activities. At the point when the client visits the webpage, he/she would initially need to enroll into the site through enlistment structure [5]. Client will be particularly coordinated with the help of voice orders, while enrolling all of the fundamental fields to be filled will be examined by site, by tapping on that compartment he/she would have to fill in them.

Previously, individuals with visual impairments were unable to send emails using the system. The multitude of email types and intricate settings made it suitable for various situations but not practical for visually impaired individuals, as they faced difficulties in sending emails. Text-based emails are not conducive to their needs, especially for the blind, as they are unable to compose emails in this format. However, voice-based email systems are highly advantageous for blind individuals. They can effortlessly utilize this technology by responding to voice commands. Unfortunately, such systems are not commonly available. As a result, visually impaired individuals have limited access to voice-based email services. This technology primarily benefits those with physical challenges.

II. LITERATURE REVIEW

A literature survey on the topic of voice-based email applications for visually impaired individuals reveals a rich landscape of research and developments aimed at enhancing accessibility and communication. Researchers have been exploring innovative solutions that leverage speech recognition, text-to-speech synthesis, and natural language processing to empower visually impaired users in their email interactions.

Badigar {et al.,} [6] gave an android application that is unequivocally made for the outwardly debilitated people to send and receive mails in a basic manner. To guarantee that there is insurance for sending and receiving the message through the application, a gear gadget with human distinguishing proof sensor is kept so that can be introduced into the cell using other development like nanotechnology. *Biruntha* {et al.,} [7] gave an application the text can be converted to voice and voice and be converted to text. This can be used for bidirectional conversion between text and voice, as well as voice and text, has a wide range of applications that facilitate communication, accessibility, and convenience in various contexts.

Latha {et al.,} [8] provided email message structure plan that can be used by an ostensibly blocked individual to will messages, as a matter of fact and competently. The system is designed to be read aloud using text-to-speech technology or converted to text from a spoken message. *Ingle* {et al.,} [9] developed an voice based email framework which will assist them with imparting over messages serenely all alone, in view of computerized reasoning. This voice-based email framework ensures that your spoken content is well-structured, easy to convert to text or speech, and effectively conveys your message to the recipient. Adapt the framework based on specific communication needs and the preferences of the audience.

Pathan {et al.,} [10] developed an application aims to empower individuals with physical challenges, granting them access to the world on their terms. Looking ahead, this platform holds the promise of expansion, transcending its role in email services to encompass a broader spectrum of applications, including text messaging, note-taking, and hands-free interaction with various other applications through voice commands. *Prakash* {et al.,} [10] introduces a new way for visually impaired people to use email. It uses talking and listening technology to help

them write and read emails, as well as attach files. The special thing is that they don't need a keyboard, mouse, or help from others to use it. This makes it easier for them to send and receive emails, just by using their voice.

Roy {et al.,} [11] Developed a voice email system synced with Gmail requires a multidisciplinary approach, involving expertise in mobile app development, speech processing, user interface design, and API integration. It's important to focus on creating a seamless and user-friendly experience that empowers individuals, including those who are visually impaired, to communicate effectively using voice commands. belekar {et al.,} [12] Created a voice-based email system with speech-based recognition requires a thorough understanding of speech technology, mobile app development, user interface design, and email service integration. The goal is to provide an intuitive and accessible tool that empowers users to manage their emails using spoken language, catering to the needs of individuals with visual impairments and other users seeking a more efficient and hands-free email experience.

Pydala {et al.,} [13] application designed to address the navigation and obstacle detection challenges faced by visually impaired individuals. Leveraging the capabilities of smartphones and state-of-the-art sensor technologies, Smart Eye offers real-time navigation assistance and obstacle detection, empowering visually impaired users to navigate their surroundings more independently and safely.

III. PROBLEM DEFINITION

The technology that is currently being used in mail system is very difficult to use by visually challenged people as they require visual perception in order to use those technologies [14]. However not everyone can use the internet as there are some issues with that too. This is happening because when you're accessing the internet one must know what is shown on the screen. Consequently we have concocted a venture in which our framework will give a voice based email which can be utilized by the individuals who are not very great in utilizing the PC framework and individuals who have average related issues in an issue freeway. The users who will be using our system need to worry about any of the keyboard information and its shortcuts or where the keys are located in order to type.

IV. OBJECTIVES AND METHODOLOGY

The primary objective of the voice-based email application is to empower visually impaired individuals with a user-friendly, efficient, and inclusive means of managing their email communications. By leveraging advanced speech technologies, intuitive user interfaces, and seamless integration's, the application aims to enhance accessibility, independence, and engagement in the digital world for users with visual impairments [15]. The development of a voice-based email application for visually impaired users involves a systematic process aimed at creating a user-friendly and accessible platform. Beginning with a comprehensive analysis of user requirements and challenges, the design phase incorporates direct collaboration with visually impaired individuals to ensure an intuitive interface that accommodates both touch and voice interactions. Strategic selection of speech recognition, natural language processing, and text-to-speech technologies forms the backbone of the application's functionality. The architecture encompasses modular components for user management, email handling, and communication, while a well-structured database ensures efficient data storage and retrieval as shown in Figure-1. Through iterative development, rigorous user testing, and adherence to accessibility standards, the application ensures that visually impaired users can effectively manage emails using voice commands. Seamless integration with email services, performance optimization, security measures, and clear documentation contribute to the app's successful deployment and continuous improvement, fostering greater accessibility, independence, and overall user satisfaction for the visually impaired community [16].

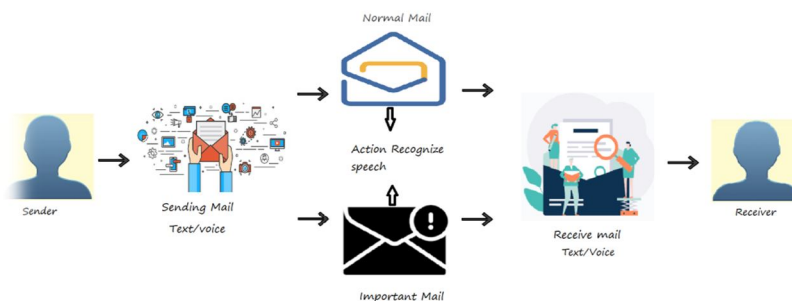


Figure-1: Methodology

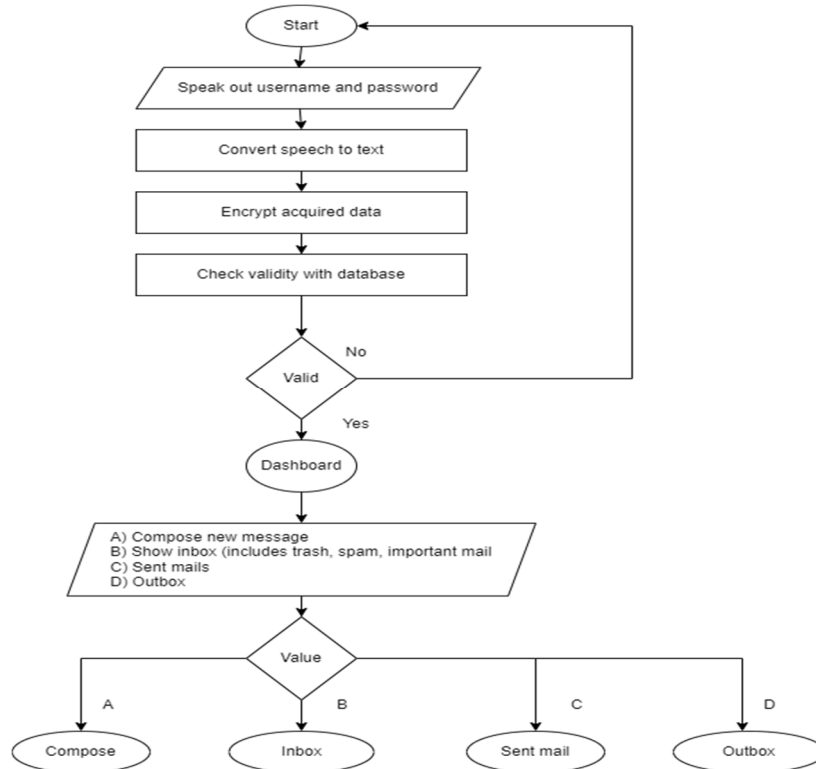
V. SYSTEM ARCHITECTURE

The system architecture for a voice-based email application involves the arrangement of various components and modules that work together to enable users to compose, manage, and interact with emails using spoken language. This system architecture forms a foundation for a comprehensive voice-based email application that offers sign-up, login, email management, and communication functionalities, catering to the needs of visually impaired users while ensuring security, usability, and accessibility. The entire system architecture ensures a seamless and user-friendly experience for visually impaired users, enabling them to interact with email functionalities effectively using spoken language. The integration of speech recognition, natural language processing, and text-to-speech technologies enhances accessibility and independence for individuals with visual impairments [17]. Figure 2 shows the comprehensive system architecture for a voice-based email application that includes all the mentioned features below:

- 1) **Registration Module:** Responsible for processing user registration requests. It validates the provided information, such as checking for existing usernames or email addresses, and creates new accounts.
- 2) **Authentication Module:** Responsible for verifying user credentials by comparing them with the stored data in the user database. It grants access upon successful authentication.
- 3) **Email Management Module:** This module interacts with the user's email account through APIs provided by the email service (e.g., Gmail API). It retrieves emails from different folders, allows marking as important, sending emails, and performing other actions.
- 4) **Composing Module:** Gathers the email content entered by the user and sends it to the email service using appropriate APIs. It ensures accurate transmission of the email.
- 5) **Sign-Out Module:** Handles the termination of the user session by clearing active authentication tokens, ensuring a secure sign-out process.

A. Speech to text converter

A Speech-to-Text (STT) converter, also known as Automatic Speech Recognition (ASR), is a crucial component of the voice-based email application for visually impaired users. It enables spoken commands and messages to be accurately transcribed into text, which can then be processed and used within the application [18]. The Speech-to-Text converter plays a pivotal role in enabling visually impaired users to interact with the email application using their voice. This process involves several steps:



- 1) **Audio Input:** The user speaks commands or messages into the device's microphone. The audio input may include various spoken language patterns, tones, accents, and pauses.
- 2) **Audio Preprocessing:** The raw audio input undergoes preprocessing, which involves noise reduction, filtering, and normalization to enhance the quality of the speech signal.
- 3) **Acoustic Modeling:** The processed audio signal is matched against a pre-trained acoustic model. This model contains statistical patterns that represent phonetic and acoustic properties of spoken language.
- 4) **Phonetic Analysis:** The system identifies phonemes (distinct speech sounds) and maps them to probable words using statistical probabilities based on the acoustic model.
- 5) **Language Modeling:** The text output from the phonetic analysis is further refined using a language model. This model incorporates the probabilities of word sequences to improve the accuracy of the transcribed text.
- 6) **Text Generation:** The final step involves generating the transcribed text, which represents what the user has spoken. This text can then be used for various purposes within the application.

The Speech-to-Text converter is a foundational technology that enables visually impaired users to interact effectively with the voice-based email application. Its accurate transcription of spoken language into text facilitates seamless communication, enhances accessibility, and empowers users to navigate, compose, and manage emails using their natural voice.

B. Text to speech converter

The Text-to-Speech (TTS) Converter is a crucial component of the voice-based email application that enhances accessibility by converting textual email content into natural and intelligible spoken language. It allows visually impaired users to listen to the content of their emails, eliminating the need to read text visually [19].

- 1) **Email Content Conversion:** When a user selects an email to be read, the TTS Converter processes the email's textual content, including subject, sender, and message body.
- 2) **Speech Synthesis:** The TTS Converter utilizes sophisticated algorithms and linguistic models to generate spoken language that sounds natural, with proper intonations, emphasis, and pauses.
- 3) **Customizable Settings:** Users may have preferences for speech rate, pitch, volume, and voice gender. The TTS Converter typically offers adjustable settings to accommodate individual preferences.
- 4) **Playback Control:** The converted speech is played back to the user through the app's audio output. Playback controls allow users to pause, resume, rewind, or fast forward the speech as needed.

The Text-to-Speech Converter component plays a pivotal role in the voice-based email application by enabling visually impaired users to access and comprehend email content through spoken language. Its advanced technology, customizable settings, and intuitive implementation contribute to a more inclusive and user-friendly email experience for individuals with visual impairments.

VI. IMPLEMENTATION AND RESULTS

The proposed system is an android application where you start by speaking out whether you want to login or sign up. The application speaks and asks for username and password if it is for login or signup. Once after you sign up or login the given details will be read out loud as a confirmation. After the login or sign up it goes to dashboard you can see compose, inbox, important inbox, sent, outbox, spam, trash and sign-out. In compose you will be asked about the mail of the user that has to receive the mail, which is to user then it asks about the subject and the content of the mail whereas it later asks you if the mail is important or not so you can do accordingly. In inbox it shows the list of all the mails sent from different mails from different users.

In important mail you see all the important mails sent from different users. In sent you will see all the mails that have been sent. In the outbox the unsent mails will be present. In spam all the spam mails will be present. Trash consists of the deleted mails from the application. At last sign-out is used to logout from the current account. The best of the proposed system is that all these above mentioned functions works completely based on voice if the word or sentence is not recognized it will ask you to repeat the word or sentence once again. If the command is not found inside any of the functionality it will return back to the dashboard.

The user has to sign up if he is a new user or go for login directly if the registration is already done. For the communication to happen in an easy manner this application was created so if anyone has to use this application then he/she must first sign up. After user signup, the user will have a dashboard where the user can give their own option like compose, inbox, important inbox, sent, outbox, spam, trash and sign-out as shown in Figure-3.

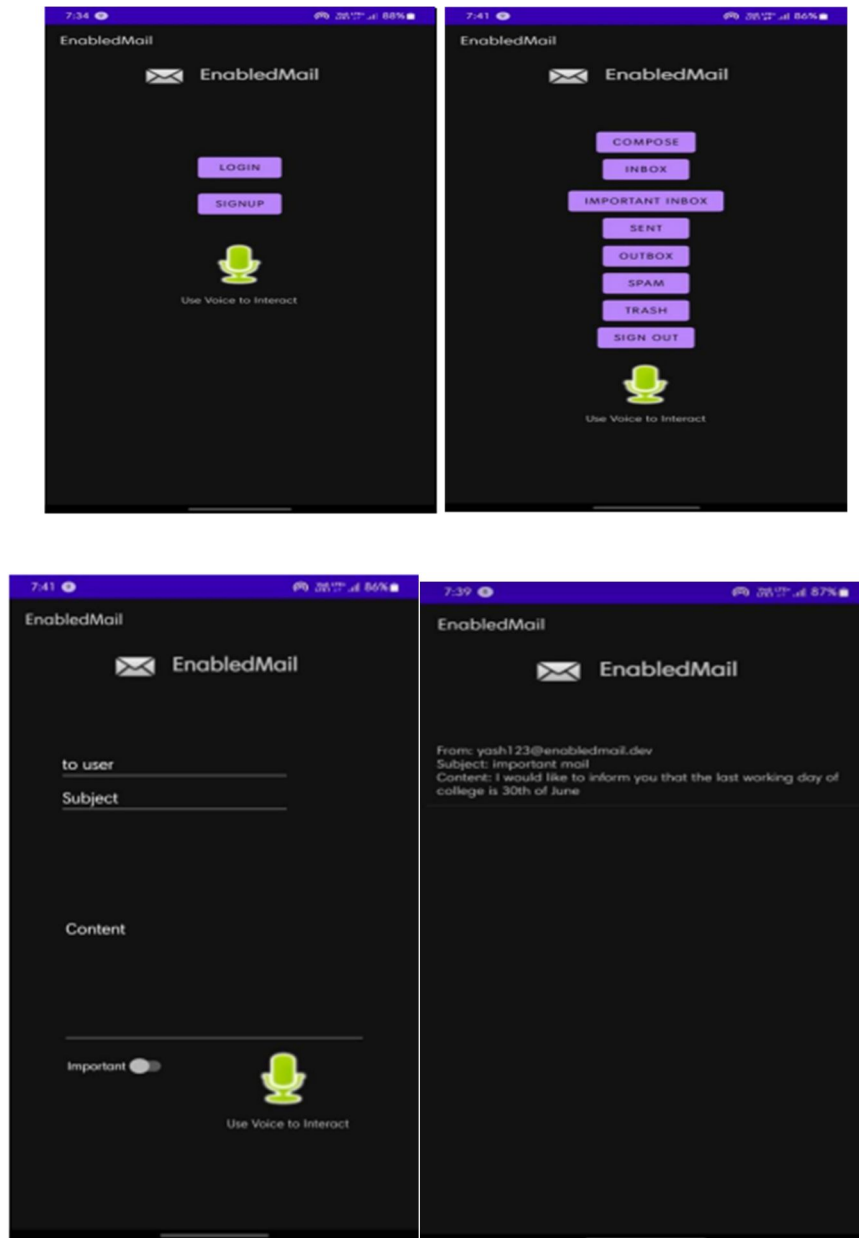


Figure-3: Application Screenshots

VII. CONCLUSION

This proposed system that we have come up with will help to overcome some disadvantages that were previously encountered by the visually impaired and disabled in accessing the emails. The idea of using the keyboard and the mouse has been eliminated. The visually impaired people can send and receive the emails without any effort through voice commands without any use of a keyboard. This system has helped blind people to face difficulties and made them normal individuals. The android application that we proposed is designed especially for blind people, and the leverage is, even normal people can also use the android application in the normal way. This android application provides emailing services where the users can easily read and send the mail to the other users on their own without the help of third person or without any guidance from other people. In this application the users doesn't have to use keyboards which will perform some particular operation, so you can use the application without keyboard and perform operations like: Compose, inbox, outbox, spam, trash and at last important mail etc. This email system can be used by both blind and normal people very efficiently. Screen readers,

Braille keyboards etc, were useful for their studies. For this reason, this application can be used by blind and normal people to send and receive the mail without using keyboard and mouse from sender and receiver.

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