Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

VOICE BASED EMAIL ASSISTANT FOR VISUALLY IMPAIRED

Dr. B. ESTHER SUNANDA, Assistant Professor, Department of Computer Science, Andhra University College Of Engineering For Women, Visakhapatnam, 530003, bonnie.sunandha@gmail.com
MALLAJYOSULA SAI ASRITHA, Student, Andhra University College Of Engineering For Women, Visakhapatnam, 530003, saiasritha29@gmail.com
MATCHA ARUNA, Student, Andhra University College Of Engineering For Women, Visakhapatnam, 530003, aruba.matcha@gmail.com
MOHAMMED AFSANA PARVEEN, Student, Andhra University College Of Engineering For Women, Visakhapatnam, 530003, afsanaparveen2828@gmail.com
MUDUNURI KEERTHI TEJASWI, Student, Andhra University College Of Engineering For Women, Visakhapatnam, 530003, mkeerthitejaswi@gmail.com
NALLAMOTHU KEERTHI, Student, Andhra University College Of Engineering For Women, Visakhapatnam, 530003, keerthinallamothu11@gmail.com

ABSTRACT
Recognizing the unique difficulties faced by the blind community in standard email interfaces, our project sets out to transform this experience into intuitive, appealing and supportive. This project introduces a user-friendly Virtual Voice Based Email System for visually impaired, and is designed specifically for individuals with visual disabilities. Email is an advantageous way to communicate with individuals or a small group of friends or people. It permits users to effortlessly transfer documents, pictures, links and other files. This system leverages advanced speech recognition application, allowing users to compose, send, and manage mails effortlessly through audio instructions. This application not only empowers the blind community to effortlessly compose and send This research paper goal is to explore the design and development of a voice-based virtual assistant for blind people in email communication. emails but also provides voice-guided navigation for efficient email management by converting email text into speech and vice versa. We believe that everyone should enjoy the wonderful world of email and Virtual Voice Based Email System is here to make that happen. It's not just a tool; it's a friend in your digital world, making communication accessible and enjoyable for everyone including people with visual impairments.

Keywords:
Speech Recognition, Email communication, Voice-based Virtual Assistant, Visual Impairments, Empowerment, Digital Communication

1.INTRODUCTION

In our modern world, sending emails is a big part of staying connected. But what if particular users can't see the screen? That's where our new Virtual Based Email System comes in! It's like having a friendly assistant that listens to your voice and helps you send emails without typing. For people who can't see well, regular emails can be tricky, so we created a solution that lets you talk to your email and make it super easy. In the era of ubiquitous mobile, where virtual assistants efficiently handle various tasks through voice commands, there remains a notable gap in effective solutions for blind individuals to manage their email systems. To address this issue, our research focuses on developing an information retrieval toolkit tailored for the visually impaired. This toolkit aims to convert email information into voice format, providing a seamless auditory experience for users to access and manage their emails. Conventional mail services lack accessibility for visually challenged, and existing innovation, such as screen readers and speech recognition, often fall short in delivering a satisfactory user experience. Our research introduces a Voice-Based Email System specifically designed for the people who are visually challenged, employing speech to text and text to speech converters. This

innovative application empowers users to control their mail accounts entirely through commands, promoting inclusivity and granting equal access to email communication for visually challenged individuals. The design concept revolves around creating a user friendly voice email system seamlessly integrated with email functionality, ultimately fostering social advancements and accessibility. With this system, you just say what you want, like “send an email” or “check inbox” and it does the rest. No need to type or struggle with small buttons. we understand how hard it can be for the blind to use standard email, so our goal is to make emailing fun, accessible, stress-free for everyone. Join us on this exciting journey to bring the joy of communication to everyone, regardless of visual abilities. The main aim of virtual voice-based email assistance for visually impaired is to help people with visual impairments to independently manage their email communications using spoken commands and feedback. This innovation aims to increase accessibility and inclusivity by allowing visually impaired people to compose, send, receive, and manage mails through audio instructions, thus reducing reliance on traditional visual interfaces.

2. SYSTEM ARCHITECTURE AND METHODOLOGY

Background:

Voice searches, especially through mobile devices, have surpassed those conducted on PCs, with an expected 50% of researches projected to be voice-based by 2020. Virtual assistants are becoming increasingly sophisticated, empowered to streamline tasks like email management. The development of virtual assistants for the blind is grounded in the broader field of assistive technology, which aims to create tools and devices that enhance the independence and quality of life for individuals with disabilities. Assistive technology has been pivotal in addressing challenges faced by individuals with visual impairments.

These technologies include screen readers, Braille displays, and magnification software, designed to make digital information accessible the virtual voice assistant aims to empower blind users by providing functionality such as reading aloud text, managing tasks, and facilitating communication through voice interactions. This technology is designed to operate through spoken commands, utilizing voice recognition and natural language processing. The primary focus is on enhancing accessibility, ensuring similarity with screen readers and other dependable technologies frequently used by the visually impaired.

Need of the Project:

Voice-based email for individuals who are blind addresses several key challenges they face in accessing and managing electronic communication.

Firstly, navigating the traditional visual interfaces of email platforms can be daunting for users who rely on screen readers or other assistive technologies. These interfaces often lack proper labelling or are not optimized for screen reader compatibility, making it difficult for blind users to efficiently navigate through their emails, compose messages, or perform other essential tasks.

Secondly, typing out emails using a standard keyboard can be time-consuming and error-prone for individuals who are blind, especially if they are not proficient touch typists. Voice-based email systems offer a more natural and efficient alternative, allowing users to dictate their messages verbally, reducing the barrier to communication and increasing productivity.

Moreover, voice-based email solutions can combine seamlessly with existing dependable technologies, such as screen readers and voice assistants, providing a cohesive and intuitive user experience. This integration enables blind users to access their emails hands-free, relying solely on voice commands to perform tasks like reading, replying to, and managing messages.

Additionally, by utilizing voice-based email, individuals who are blind can stay connected and engaged in both personal and professional spheres, enhancing their independence and social inclusion. Accessible communication tools are essential for ensuring equal participation in today's digital society, and voice-based email is a vital step towards achieving that goal for people with visual impairments.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

Methodology:

Researching the requirements and challenges faced by visually impaired users while accessing emails and determining the necessary features required for the applications such as composing, sending, receiving, replying, forwarding and deleting emails using voice instructions. Implement the TTS and STT conversion features and test them with sample data to ensure accuracy and reliability.

- **Applications:** Django is a web framework that is supported by high level Python which uplifts fast development and clean, realistic design. Django was built by skillful developers, it which simplifies task like database management, URL routing and template renting. It's free of cost and available for everyone.
- **Voice & Text Recognition Library:** Speech and text recognition is the ability of device software to recognize text words and text phrases in spoken language and translate them to human-understandable text. We can convert voice to text and vice versa in Python using the Voice and Text recognition library.

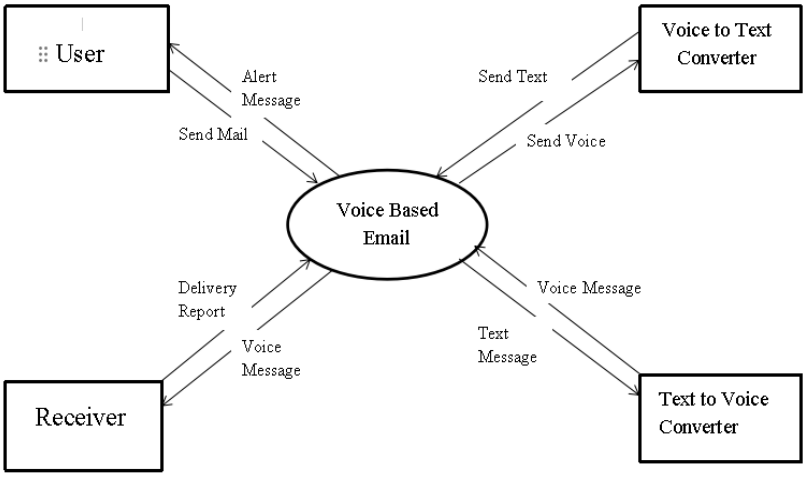

Fig-1: Dataflow Diagram

- **Play Sound & Play Audio Library**: Play sound library goal is to process audio that simplifies tasks related to working with audio files. It is a cross platform and one function module with no dependencies for playing audio. If you want to play a audio file, then this will do it. You can play audio with given line command.
- **PYTTSX3**: It is a module that is used for TTS conversion in Python. Unlike many other TTS libraries, it works without internet and is compatible with both Python 2 and 3. Below Figure 2 Shows Text To Speech Conversion(TTS).

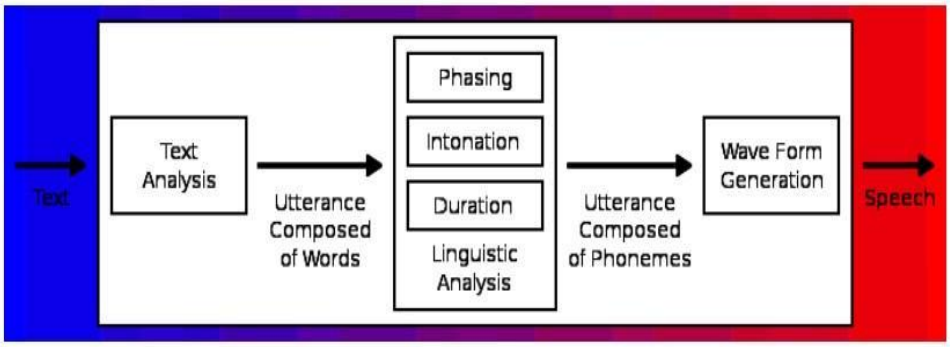

Fig-2: TTS Conversion

- **IMAP Client**: It actually uses the IMAP library from the standard Python under the hood, it gives a different API. It performs extra parsing work, readily usable and uses sensible Python types.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

- **SMTP**: The Simple Mail Transfer Protocol (SMTP) is the standard protocol commonly used for transferring mails over the internet. It's like the postal service for emails, ensuring that messages are delivered from the sender to the recipient's email server.

Hardware and Software Requirements:
Hardware Prerequisites:
• 1 GM RAM
• 200 GB Hard Disk Drive
• Intel 1.66 GHz Processor Pentium4

Software Prerequisites:
• Windows 10
• Visual Studio Code
• Windows Operating System
• Backend – Python
• Framework – Django

3. SYSTEM DESIGN:
• The system is designed for visually impaired users so that they can communicate through mails. This is a web-based applications that connects email server to the application. And this system ensures security such as user authentication. Users has to login with correct email id and password. If the mail id and password is right, then it will direct the user to the menu page, if not the user cannot access the application.
• On the menu page there are 5 options follows as:
1. Compose
2. Inbox
3. Drive
4. Trash
5. Logout

These options have their own specific functioning. And the work of these options is done by using only voice commands.

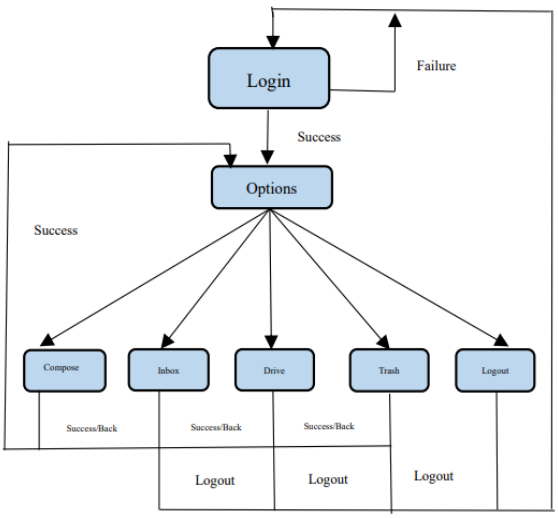

Fig-3: System Design of Proposed System

4. UML DIAGRAMS

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

The Unified Modelling Language (UML) can be used to visualize software and systems through UML diagrams. To comprehend the designs, code architecture, and suggested implementation of complex software systems, software engineers generate UML diagrams. Moreover, business processes and workflows are modelled using UML diagrams.

4.1. USE CASE DIAGRAM

Use cases serve as a representation of the system's functionality during requirement elicitation and analysis. A use case is a description of a system function that provides an actor with an apparent outcome.

In the below figure 4, the system provides audio instructions and performs various operations, ensuring a seamless user experience in managing emails via voice commands. The system receives voice input, interprets user commands, and converts them into text for processing. It utilizes a voice converter to facilitate the conversion of spoken words into text, enhancing accessibility.

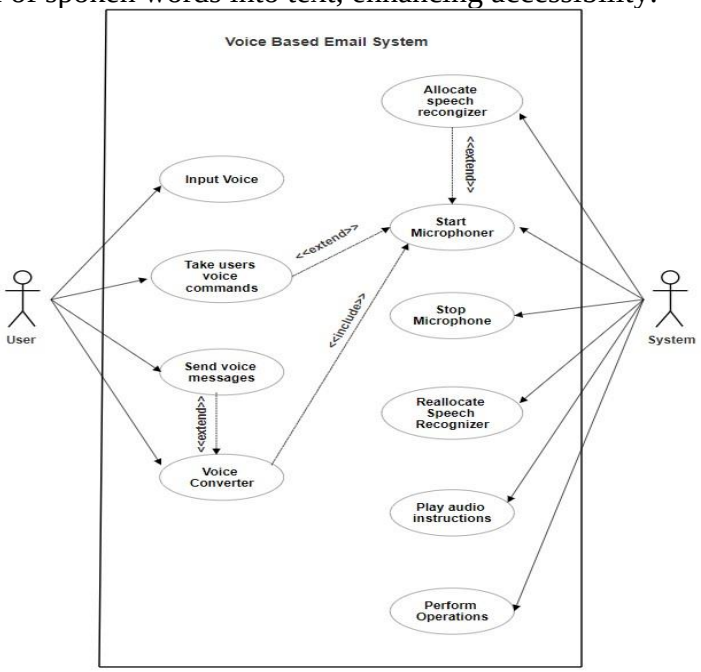

Figure - 4. Use case Diagram

4.2 STATE CHART DIAGRAM

A state machine that depicts class behaviour is described by a state chart diagram. By simulating the life cycle of each class of object, it represents the dynamic behaviour of objects across time and displays the actual state changes rather than the processes or commands that cause those changes.

In the below figure 5, the system remains in an idle state until prompted by the user. Upon user interaction, it performs speech-to-text conversion to interpret commands and constructs messages accordingly. After translating user commands, the system executes the actions, such as composing emails or accessing inbox messages. It then performs text-to-speech conversion to read out the relevant data to the user.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

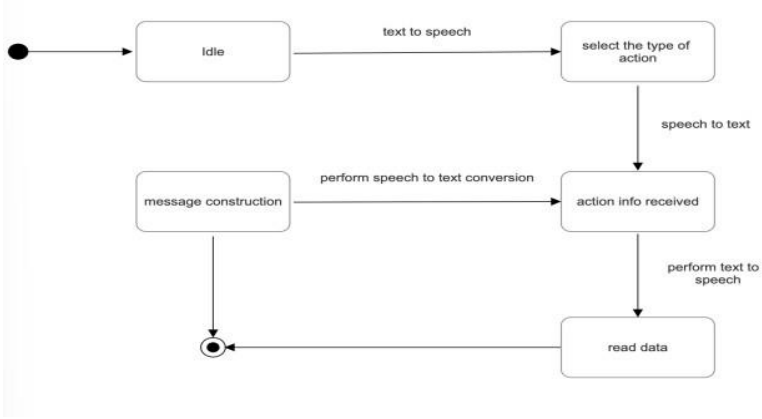

Figure 5. State Chart Diagram

4.3. ACTIVITY DIAGRAM

An example of a UML (Unified Modelling Language) diagram used to show how activities or actions flow inside a system or process is an activity diagram.
In the below figure 6, it involves activities such as "Compose Email," "Access Inbox," "Access Trash," and "Access Drive."

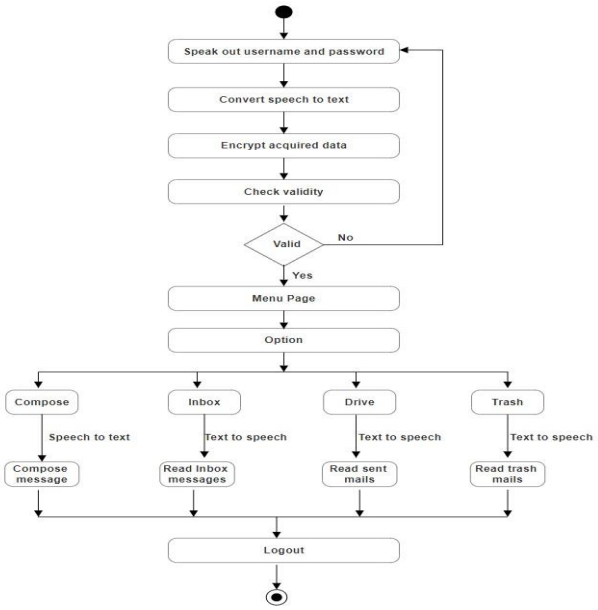

Figure 6. Activity Diagram

4.4. SEQUENCE DIAGRAM

The temporal sequence of the objects involved in the interaction is shown on the sequence diagram. Diagram 7 below shows how the user interacts with the mail server, interactive voice response system, speech-to-text converter, and speech-to-speech converter during login, email interaction, action execution, and logout. Component-to-component messages explain how data and control flow through the system, including how it manages successful and unsuccessful login attempts, reacts to user commands, carries out operations, and finishes logout procedures.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

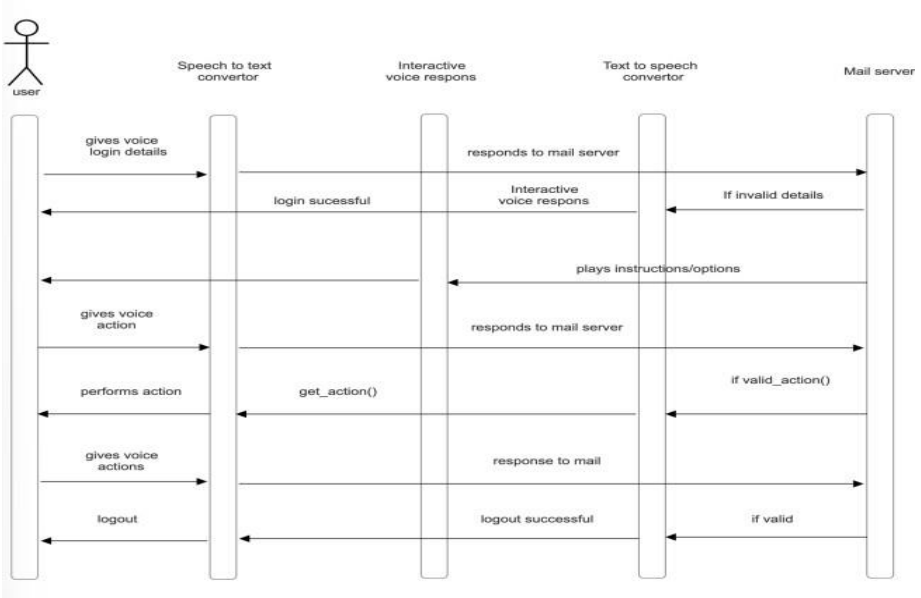

Figure 7. Sequence Diagram

5. IMPLEMENTATION

Algorithm of the Proposed System:

Creating an algorithm for a voice-based email system involves several steps. Here's a high-level outline:

1. Voice Input:
- Receive voice commands from the user
- Use STT technology to convert the voice input into text.

2. Intent Recognition:
- Analyze the text to determine the user's intent (e.g., composing a new email, checking inbox, etc.).
- Use natural language understanding (NLU) techniques to extract relevant information from the text.

3. Authentication:
- Authenticate the user to ensure security and privacy.
- Verify user identity through voice recognition or other authentication methods.

4. Email Interaction:
- If composing a new email:
- Prompt the user for recipient, subject, and message content.
- Use text-to-speech technology to confirm and summarize the email before sending
- Send the email using appropriate email protocols
- If checking inbox:
- Retrieve the user's email inbox.
- Use text-to-speech to read out email subjects or sender names.
- Allow the user to select emails for further action.

5.Feedback and Confirmation:
- Provide feedback to the user at each step to ensure clarity and understanding.
- Confirm user actions before proceeding (e.g., "Would you like to send this email?").

6.Error Handling:
- Handle errors gracefully, such as misinterpreted voice commands or authentication failures.
- Provide helpful error messages and suggestions for corrective actions.

7.Accessibility and Usability:
- Design the system with accessibility in mind, ensuring it can accommodate users with different needs

- Optimize the user interface for ease of use, considering factors like clear voice prompts and intuitive navigation.

8. Continuous Improvement:

- Gather user feedback and data to improve the system over time.
- Incorporate machine learning techniques to enhance speech recognition accuracy and intent understanding.

This algorithm provides a structured approach to build a voice-based email system, but the implementation details will vary based on the specific technology stack and platform prerequisites.

6.RESULT AND DISCUSSION

The result of the project is a web application which activates the IVR between the user and the system. It has pages like login, menu, compose, inbox, drive and trash. Each page has its own operations. User can select operations through voice commands.

The login page of the application is the first step to start voice assistant mail. This page activates with a free tap and user need to login with help correct email and password. If the mail and password are authenticated, then it directs to the menu page. This process runs in speech to text conversion through user voice commands.

The menu page is the second phase of the application. Once the login is successfully completed, then this page appears with options such as compose, inbox, drive, trash and logout. The page activates with a free tap on the screen and system enables the user to select the options with voice commands and the user reciprocates according to the actions they want to accomplish.

The compose mail page appears in the application when the user chooses to compose a mail. This page activates with a free tap, where the user can compose a mail with speech-to-text conversion by users. Recipients email Id, subject and body of the email is provided by the users, and then the mail is composed and sent to the recipients email and redirects to menu page after composing.

The inbox page appears in the application when the user chooses to read inbox mails. This page activates with a free tap and allow the user to understand the options available in inbox page through TTS conversion. And the user can select the options provided through speech. The options available in inbox are unread, search, return and logout. These options have specific operations which are performed when the user summons the action.

The drive mails page appears when the user chooses to read drive mails where the composed mails are stored. This page has options as search, return and logout. Search is used to search a specific mail in the drive mails using subject as key, return is used for redirecting to the menu page and logout for redirecting to the login page.

The trash folder page appears when the user chooses to read trash mail. This page has options as search, return and logout. And we can return back to menu page using return and can directly logout from trash folder using logout option.

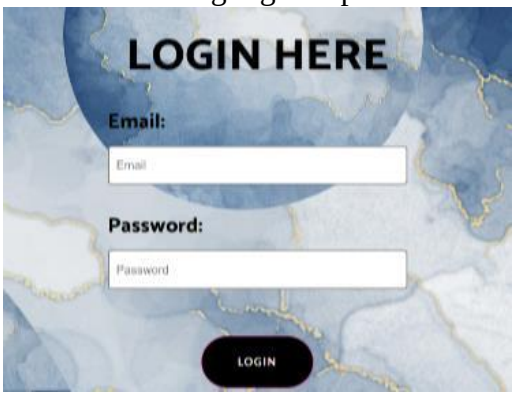

Fig-8: Login Page

Fig-9: Menu Page

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 3, No. 4, March : 2024

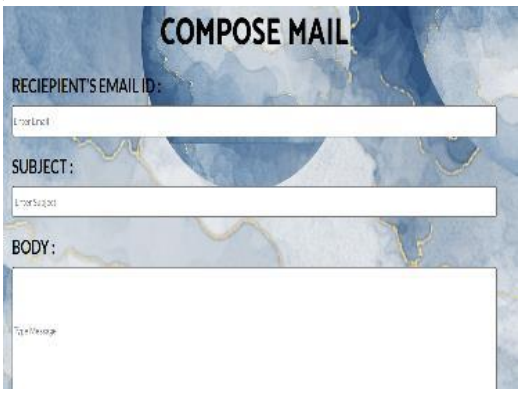

Fig-10: Compose Page

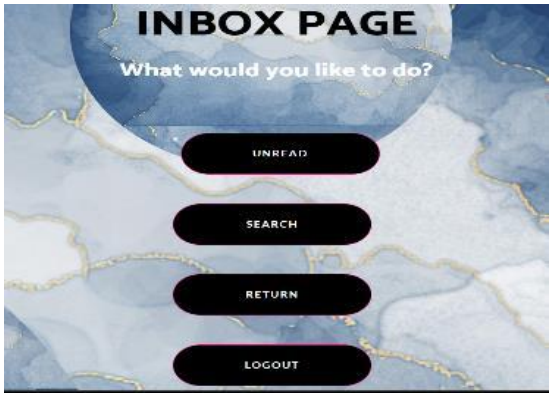

Fig-11: Inbox Page

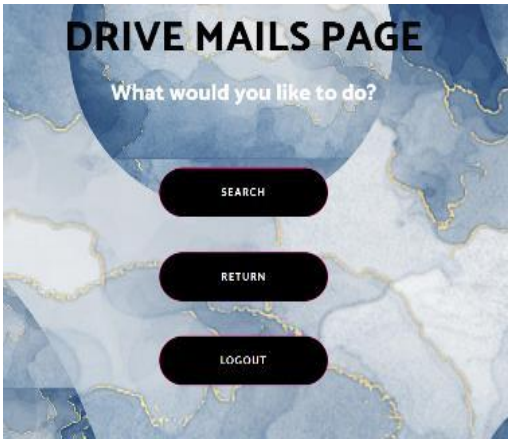

Fig-12: Drive Mails Page

Fig-13: Trash Page

7. CONCLUSION AND FUTURE SCOPE

In Conclusion, the voice-based virtual assistant for blind people in email projects offers a practical and effective solution for blind individuals to independently manage their email accounts. By leveraging natural NLP and voice recognition technologies, the systems offer a user friendly and efficient solution to the challenges faced by blind individuals in digital communications. The system's implementation and user feedback demonstrate its potential to enhance accessibility and improve the quality of life for the visually impaired community. Overall, they play a crucial role in bridging the accessibility gap and empowering the blind community to participate more fully in the digital world.

Further development and refinement of the system can open doors for more inclusive and efficient communication experiences for blind individuals. The ensuing of voice-based email systems for the blind holds immense potential for further innovation and improvement. One avenue for advancement lies in enhancing natural language processing capabilities to make the systems even more intuitive and responsive. Additionally, integrating voice-based email systems with popular smart assistants and expanding support for multiple languages would broaden accessibility and usability. Strengthening security measures to protect users' privacy and integrating with other digital platforms could also enhance the functionality and utility of these systems. Furthermore, offering customization options and continually seeking user feedback for iterative development are key strategies for refining and improving voice-based email systems over time. Through ongoing innovation and collaboration, developers can continue to enhance the accessibility, inclusivity, and independence of digital communication for the blind community. The application evolved now is only designed for working on systems. As the use of phones has immensely increased as a trend today, there is a scope to enhance this facility as an application in mobile phones for easy accessing. Also, ensuring safety measures and authentication processes are to be implemented in the mobile version applications and are to be revised to make the system safer.

REFERENCES

[1] Jagtap Nilesh, Pawan Alai, Chavhan Swapnil and Bendre M.R.. "Voice Based System in Desktop and Mobile Devices for Blind People". In International Journal of Emerging Technology and Advanced Engineering (IJETAE), 2014 on Pages 404-407 (Volume 4, issue 2).
[2] Ummuhani Sifa U.,Nizar Banu P K , "Voice Based Search Engine and Web page Reader". In the International Journal of Computational Engineering Research (IJCER). Pages 1-5.
[3] Geeks For Geeks: https://www.geeksforgeeks.org/project-idea-voice-based-email visually challenged/
[4] K. Jayachandran and P. Anbumani "Voice Based Email for Blind People" in International Journal of Advance Research, Ideas and Innovations in Technology(IJARIIT),2017 on Pages 1065-1071
[5] Pranjal Ingle, Harshada Kanade and Arti Lanke " Voice based e-mail system for blinds" in International Journal of Research Studies in Computer Science and Engineering(IJRSCSE), 2016 on Pages 25-30 (Volume 3, issue 1)
[6] G. Broll, S. Keck, P. Holleis and A. Butz, "Improving the Accessibility of NFC/RFID-based Mobile Interaction through Learnability and Guidance", International Conference on Human-Computer Interaction with Mobile devices and services, vol. 11, (2009).