

Voice Based Email System For Blind People

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Abstract: *The Voice Based Email System for Blind People is an assistive technology project designed to help visually impaired users access email services easily through voice commands. Traditional email systems require the use of keyboards, screens, and mouse operations, which are difficult for blind users. This system overcomes these challenges by using **Speech-to-Text (STT)** and **Text-to-Speech (TTS)** technologies. The user can compose, send, receive, and read emails using voice instructions without needing visual interaction. The system converts spoken words into text for email composition and reads incoming emails aloud to the user. It provides a simple, user-friendly, and accessible interface that improves communication and independence for blind people. The project aims to make digital communication more convenient, efficient, and accessible for visually impaired users.*

Keywords: Speech-to-Text (STT), Text-to-Speech (TTS), Accessibility, Email Automation, Assistive Technology, Voice Recognition, Artificial Intelligence

I. INTRODUCTION

The Voice Based Email System for Blind People is an assistive technology developed to help visually impaired users access email services through voice commands. Traditional email systems are difficult for blind users because they require keyboards and screens. This system uses Speech-to-Text (STT) and Text-to-Speech (TTS) technologies to allow users to send, receive, and read emails easily using voice interaction. The main goal of the project is to provide an accessible, simple, and independent communication platform for blind people..

II. PROBLEM STATEMENT

Traditional email systems are difficult for visually impaired people to use because they depend on visual interfaces, keyboards, and mouse operations. Blind users face challenges in reading, composing, and managing emails independently. Therefore, there is a need for a voice-based email system that allows visually impaired users to access email services easily through speech interaction.

OBJECTIVES

- To provide an accessible email system for blind people.
- To allow users to send and receive emails using voice commands.
- To reduce dependency on keyboards and mouse operations.
- To improve communication and independence for visually impaired users.

SCOPE

The Voice Based Email System for Blind People helps visually impaired users send, receive, and read emails using voice commands. It provides an easy and accessible communication platform without requiring a keyboard or mouse. The system aims to improve independence and digital accessibility for blind users.



III. LITERATURE SURVEY

TABLE I: LITERATURE SURVEY

Sr. No	Title	Author	Year	Methodology Used	Conclusion
1.	“Voice Based Email System for Blind People”	R. Shinde, S. Patil	2021	Uses Speech-to-Text and Text-to-Speech technologies for voice-controlled email operations..	Helps visually impaired users access email services independently and easily..
2.	“Smart Voice Email System Using Artificial Intelligence”	P. Kumar, A. Singh	2022	Uses AI-based speech recognition and NLP techniques for email interaction..	Improves communication efficiency but accuracy depends on voice clarity..
3.	“Accessible Email System for Visually Impaired Users”	M. Sharma, R. Gupta	2020	Uses voice commands and audio feedback system for composing and reading emails.	Provides user-friendly accessibility features for blind users..
4.	“AI-Based Voice Assistant for Email Management”	S. Subhash et al.	2020	Uses speech recognition and Natural Language Processing to perform email tasks through voice..	Enables hands-free email management but performance may reduce in noisy environments..

IV. METHODOLOGY

The proposed system is designed as an assistive email communication platform for visually impaired users by integrating Speech-to-Text (STT), Text-to-Speech (TTS), and voice command technologies. The development process is structured into the following stages:

A. Data Acquisition

The system captures voice input from the user through a microphone. The audio input is processed for recognizing commands and converting speech into text for email operations such as composing, sending, and reading emails.

B. Speech-to-Text Processing

The Speech-to-Text module converts the user’s spoken words into text format using speech recognition technology.

- Allows users to compose emails through voice input
- Recognizes commands such as send, read, reply, and delete
- Reduces dependency on keyboard typing

C. Text-to-Speech Module

The Text-to-Speech module converts text emails into audio output so that visually impaired users can listen to the content easily.

- Reads incoming emails aloud
- Provides audio feedback for user actions
- Improves accessibility and user interaction

D. Voice Command Processing

Voice commands are processed using speech recognition libraries. The system identifies predefined commands and performs corresponding actions.

- Commands include compose mail, open inbox, send email, and delete mail
- Enables hands-free email management



- Improves ease of use for blind users

E. Email Management System

The system uses email protocols such as SMTP and IMAP to send and receive emails securely.

- SMTP is used for sending emails
- IMAP is used for reading and managing inbox emails
- Ensures smooth communication between the user and email server

F. System Integration

All modules are integrated into a single user-friendly application. The system coordinates voice input, email processing, and audio output to provide smooth and efficient interaction for visually impaired users.

G. Implementation Tools

- Programming Language: Python
- Libraries Used: SpeechRecognition, Pytsx3, SMTPLIB, IMAPLIB
- Technologies Used: Speech-to-Text (STT), Text-to-Speech (TTS)

H. Testing and Validation

The system is tested in different environments to evaluate voice recognition accuracy and system performance. Results show that the system provides effective and accessible email interaction for visually impaired users with minimal difficulty.

IV. MODELING & ANALYSIS

The system converts voice input into meaningful email operations using speech processing, text conversion, and command mapping techniques.

A. Speech Signal Processing

- The input voice signal is captured and converted into a digital signal for processing. The system extracts features such as frequency and amplitude to recognize spoken words.
- $S(t) = A \sin(2\pi ft)$
- This helps in analyzing the speech signal for accurate recognition.

B. Speech-to-Text Conversion

- The recognized speech is converted into text using probabilistic models. The system predicts the most likely word sequence based on the input voice:
- $W^* = \operatorname{argmax} P(W | X)$
- where X is the audio input and W is the word sequence.

This ensures accurate conversion of voice into text for email composition.

C. Text-to-Speech Conversion

- The system converts text into speech output using synthesis techniques. The generated speech signal is:
- $Y(t) = \sum_{i=1, n} a_i \cdot \phi_i(t)$
- where a_i are coefficients and $\phi_i(t)$ are basis functions. This allows the system to read emails aloud to the user.



D. Command Recognition

- The system matches the converted text with predefined commands using similarity or pattern matching:
- This helps in identifying actions such as compose, send, read, and delete email.

E. System Performance

The system processes voice input and generates output in real-time with low latency. Accuracy depends on factors like noise level, pronunciation, and microphone quality. The model ensures smooth interaction and reliable email operations for visually impaired users..

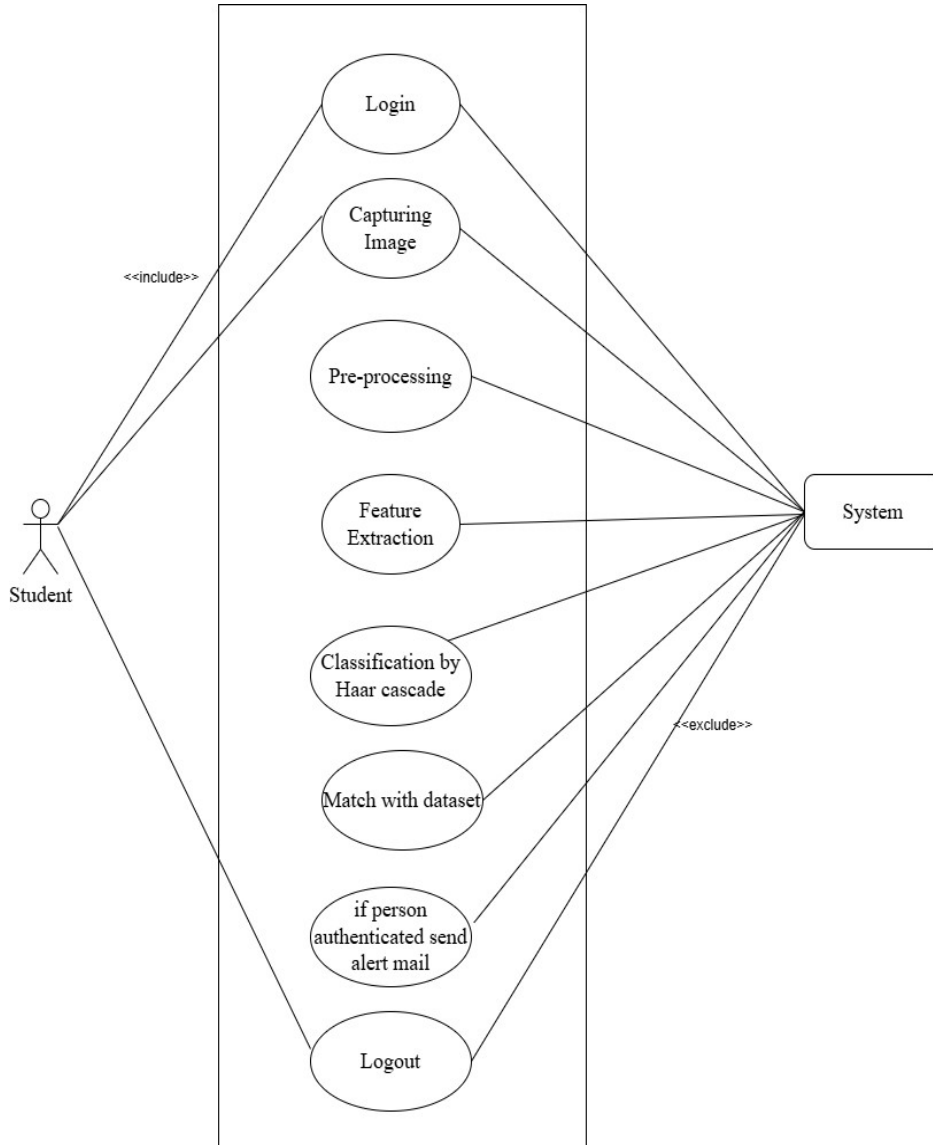


Figure 1. System Architecture



1. Login

This is the first step where the user (student) logs into the system using credentials. It ensures only authorized users can access the system.

2. Capturing Image

In this stage, the system uses a camera to capture the real-time image of the user. The captured image acts as the input for further processing. This step is essential for systems that rely on facial recognition or identity verification. The quality of the captured image directly affects the accuracy of the system.

3. Pre-processing

The captured image is processed to improve its quality and make it suitable for analysis. This includes operations like resizing, noise removal, grayscale conversion, and normalization. Pre-processing helps in reducing unwanted variations and prepares the image for better feature detection

4. Feature Extraction

In this step, important features of the image are identified and extracted. These features may include facial landmarks such as eyes, nose, and mouth or unique patterns of the face. The system converts these features into numerical data so that they can be easily compared with stored data.

5. Classification by Haar Cascade

The system uses the Haar Cascade algorithm to detect and classify objects (such as faces) in the image. It identifies whether a face is present and distinguishes it from the background. This method is fast and widely used for real-time face detection tasks.

6. Match with Dataset

After extracting features, the system compares them with the stored dataset. The dataset contains previously saved images or features of authorized users. The system checks for similarity between the input image and stored data to identify the user.

7. If Person Authenticated, Send Alert Mail

If the system successfully matches the image with the dataset, the user is authenticated. After authentication, the system sends an alert email as confirmation or notification. If the person is not recognized, the system may deny access or trigger a warning.

8. Logout

The logout process allows the user to safely exit the system. It ends the current session and ensures that no unauthorized person can access the system afterward. This step is important for maintaining system security.

V. RESULTS & DISCUSSION

- The proposed Voice Based Email System for Blind People was successfully implemented and tested in real-time using a microphone, demonstrating effective hands-free email operations.
- Speech-to-Text (STT) technology accurately converted user voice commands into text for composing and managing emails with minimal delay under normal conditions.
- Text-to-Speech (TTS) functionality effectively read incoming emails aloud, improving accessibility and ease of understanding for visually impaired users.



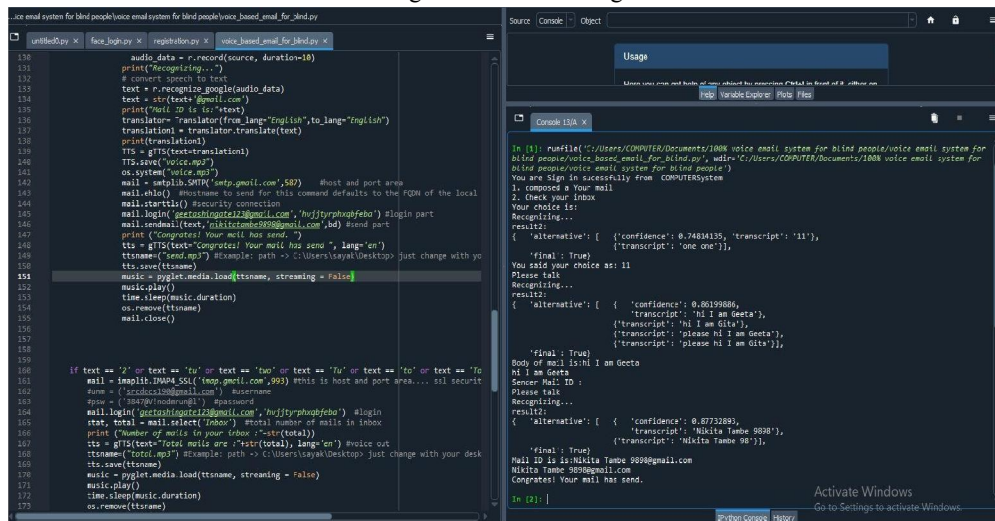
- Voice command functionality enabled users to perform email operations such as composing, sending, reading, replying, and deleting emails, enhancing overall usability.
- The integration of STT and TTS technologies provided a simple, efficient, and user-friendly interaction compared to traditional keyboard-based systems.
- The system showed good performance with low latency, ensuring smooth and responsive communication during real-time usage.
- However, performance was slightly affected in noisy environments and with unclear pronunciation, which impacted speech recognition accuracy.
- Overall, the system demonstrates a cost-effective and accessible solution for visually impaired users, with potential applications in assistive technologies and inclusive digital communication.

```

voice_email_system_for_blind_people')
Please talk
Recognizing...
result2:
{ 'alternative': [{'confidence': 0.88687539, 'transcript': 'Geeta'}],
  'final': True}
Username is:Geeta
Geeta
Please talk
Recognizing...
result2:
{ 'alternative': [{'confidence': 0.8829242, 'transcript': 'singhade'}],
  'final': True}
Last Name is:singhade
singhade
Please talk
Recognizing...
result2:
{ 'alternative': [{'confidence': 0.88687539, 'transcript': 'Geeta'}],
  'final': True}
Username is:Geeta
Geeta
Please talk
Recognizing...
result2:
{ 'alternative': [ {'confidence': 0.72492373, 'transcript': 'one'},
  {'transcript': '1'}],
  'final': True}
User id is:one
one
Please talk
<speech_recognition.AudioData object at 0x000001c47840c70>
Recognizing...

```

Figure. Voice Tracking



V. CONCLUSION

- The Voice Based Email System for Blind People provides an effective solution for enabling visually impaired users to access email services independently.
- The system successfully integrates Speech-to-Text (STT) and Text-to-Speech (TTS) technologies to allow hands-free email operations.

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