Voice Based Email system for Visually Impaired Users

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Abstract—: While Email is one of the most fundamental communication tools, its visual-based interfaces pose access barriers to those with vision loss. This project aims to eliminate this limitation by implementing an intelligent voice-based email system that will make it more accessible and independent. Cortana: Calls and Emails With this feature, you're able to both listen to and dictate your response for emails completely hands free (you don't even have to be looking at the screen) while using voice control.

For safe access, it supports a password free entry and the LBPH (Local Binary Pattern Histogram) face-recognition algorithm to secure your privacy with safer and more prompt way. The app also promotes inclusiveness by encouraging bilingual voice interaction between Kannada and English, and a dedicated Kannada-to-English Speech-to-Text (STT) module to make the app more accessible for regional language users. An additional AI spam filter, strong word processing, and STT and TTS features on the device auto-correcting words work seamlessly in conjunction to streamline and safeguard email communications. These features signify trailblazing progress in improving the accessibility, reliability, and inclusivity of email communication in the technologically advanced email communication environment for users with disabilities in email communication.

Keywords— *Voice-Based Email Accessibility, Visually Impaired Assistance, Face Recognition Authentication, Speech-to-Text, Text-to- Speech, Word Correction, Kannada-to-English STT, Bilingual Communication, Spam Filtering*

I. INTRODUCTION (*HEADING 1*)

Aiming to aid visual impairments, voicemail email systems work to provide an accessible communication method. Email have many buttons, text fields, and menus, and in email services, people with no sight face difficulties because there are no text- to-speech options. To address this email problem, users will be able to verbally command the system to compose, view, and reply to email messages. This system will use face recognition in place of passwords, using the Local Binary Pattern Histogram (LBPH) algorithm, which is said to be better in experience and security. This systems design also integrates a spam detection algorithm which is designed to enhance the experience to automatically remove emails which are not of use. All summed, this is designed to advance the digital world are visually impaired users and allow them to communicate with systems in a safe, secure, and dependable voice control. This system uses Speech-to-Text and Text-to-Speech systems for better voice communication. Also, it uses and supports diverse systems to communicate in Kannada and English; the user can communicate in Kannada and the system will translate it into English using a dedicated Kannada-to-English speech recognition system.

My major responsibilities include building a database that keeps track of user emails for training and evaluation purposes.

- Voice Commanding : System users talk to the system and give verbal command.
- Speech to Text: Users are able to speak and the system will draft a message as the user is speaking.
- Error Correction: When users are dictating an email, the system self-corrects misspelled words and incorrect phrases.
- Kannada to English Text STT Conversion: The user can speak in Kannada, and it will generate the English text for an email user wants to send.
- Text to Speech (TTS): System-generated messages and incoming emails are converted to speech.
- Face Recognition (LBPH): Provides secure, password-free and convenient authentication through facial recognition.
- Spam Filter: Using AI, it classifies and removes spam or malicious emails.
- Voice Control: Users can compose, read, and respond to emails without manual operation.

II. LITERATURE SURVEY

Transformational voice-based systems are crucial when it comes to accessibility features designed for the visually impaired. Speech recognition systems, text to speech systems, voice authentication systems like the ones on mobile phones, allow for the handsfree viewing and the management of emails and text messages. Most email interfaces are designed for visual interaction making it impossible to use for someone without vision. Systems that respond only to voice commands are key when it comes to digital inclusion. With the help of voice technologies integrated with interactive command systems that allow the user to read and write emails and send them, the

corresponding educational and communication tasks are optimized. Furthermore, these systems help the visually impaired to accomplish tasks involving communication more independently, with the use of automated speech recognition and interactive voice response [1]. Audio instruction reduces dependence on screen readers and memorizing key commands. Currently, the system is designed for desktops, though mobile approaches can be integrated with enhanced login security. The system's AI capability streamlines digital interaction, improving communication for and enhancing accessibility to individuals with vision impairments. [2]. As an incredible communication and information medium, the internet is not easily accessible to everyone, especially, the visually impaired. This research presents a voice-driven email system that allows blind operators to easily manage emails with the help of voice recognition and email reading. The email system features a personal assistance chatbot user help during email sending and reception. The system is fully registered to protect user data and ensure secure email service usage. The project provides visually impaired people with a way to optimize their digital communication activities and transform their online interactions to a fully digital, easily accessible and user-centered activities. [3]. With over 2.2 billion people all over the globe who have some degree of visual impairment, the barriers to email communication and other online services are considerable. To mitigate the challenges, the proposed system integrates speech-recognition and natural-language processing and interactive voice response technology to enable email sending and receiving without a physical keyboard. The system can be operated without training, with the voice commands and mouse movements. Even more, the system can be configured to customize more email features. This system increases autonomy, productivity and accessibility. Voice-mail based architecture allows visually impaired users also to access emails, audio multimedia, and even SMS[4].The program uses voice commands, so you do not have to type anything or think of keyboard shortcuts; therefore, simplifying your cognitive effort. It also assists users with physical disabilities and users who cannot read and write. In both the desktop version and the mobile version, users who can not see are able to send voice emails. This promotes independence in digital communication and, helps users overcome language challenges [5].Despite advancements in communication tech, visually impaired users still struggle because most communication interfaces are still visual. The proposed voice email systems solves this problem as untrained users can both electronically send and receive email without any keyboard input. Voice input is all that is required to control the system, supplemented by a mouse that does not require any complex movements. The system's IVR guidance instructions user follow-along to control the system without overloading the user. The system is designed both to promote efficiency, and to maximize accessibility for the visually impaired and users that struggle with reading [6].The purpose of this project is to create a voice driven email system for the visually challenged and illiterate. The system enables the users to use mail, send mail and receive mail without the use of sight. The voice recognition system can easily mitigate the challenges to email communications and serves a wide range of people. The system is digitally inclusive and is a one of a kind initiative in the field of assistive technology [7].A software that is built by the novel framework Django is Echo Link assists the disabled in the management of their emails by providing voice control functionality. The app lever supports voice control over various functions, such as viewing the inbox, composing, and filtering emails by starring them. Access management in the app is face- and voice- authenticated. The app is integrated with the Gmail Api and provides assistance to the disabled by summarizing emails and generating contextually relevant responses, thus providing them greater control over their email communication. It's aimed at providing the disabled with greater access and more efficient ways of communicating digitally [8].The objective of this project is to introduce a voice-based email system powered by artificial intelligence to assist the visually impaired in communicating. The system is a combination of voice email systems which allows the sender and the recipient to manage their email accounts by using voice commands. The system employs advanced artificial intelligences for speed and efficiency. The system is engineered to provide a technology solution for the digitally marginalized to participate in social interaction and advanced socialnetworks. This is a technology solution to the digitally marginalized socially challenged visually impaired members of our society. The project is designed to internet email access for the visually impaired using technology to facilitate email to voice interaction and voice to email interaction to compile and access email accounts using voice without the use of vision for email retrieval and management by the visually impaired [9]. Designed for users with varying education levels, it enhances digital inclusion by making online communication more accessible and user friendly for the visually challenged [10].

TABLE 1:COMPARISON TABLE

Author	Approach	Description
Suresh A., Paulose B., Jagan R., George J. (2016)	Developed a voice-based email system for the visually impaired using speech recognition and IVR (Interactive Voice Response) technology.	Allowed users to access and manage emails without screen interaction, providing voice authentication for login and simple navigation through spoken commands.
Kulkarni O., Alhat A., Tejankar N., Patil M. (2019)	Built a voice-mail architecture accessible through audio commands.	Allowed users with visual or physical disabilities to handle emails, multimedia, and messages through audio guidance.
Biruntha S., Priya M.G., Kiruthika R., Indupriya N., Ashwini R. (2021)	Developed an IVR-guided voice-email system.	Simplified email operations for untrained visually impaired users, offering step-by- step voice prompts for sending and reading mails.
Indalkar O., Ghorpade S., Sonone A., Pathak K. (2022)	Created a speech-controlled email platform using voice commands.	Enabled both visuallychallenged and illiterate users to send and receive emails without relying on visual cues or typing.
Abraham N.P., George J., Chandy J., Sajan K., Issac B.M. (2024)	Introduced EchoLink, a Django-based voice assistant integrated with Gmail API	Provided voice command operations, AI summarization, face recognition security, and email filtering/ starring for better usability.
Turkar R., Gaikwad S. (2023)	Conducted a review of voice-based email assistants.	Discussed integration of speech recognition, TTS, and conversational interfaces, highlighting improvements for visually impaired users.
Hari Priya S.L., Karthigasree S., Revathi K. (2015)	Proposed a "V-Mail" voice architecture for blind users.	Enabled visually impaired individuals to compose, send, and receive emails through voice commands without requiring keyboard input or screen visibility.
Harshasri M., Bhavani M.D., Ravikanth M. (2021)	Designed a voice-based email with chatbot integration using STT and TTS.	Helped blind users send/ receive emails easily, while the chatbot feature guided them through the process and enhanced accessibility.
Sai C.V., Thrinethra D., Devi S.V.S. (2023)	Implemented a speech recognition and NLP-based email system.	Focused on making the interface simple for untrained users by replacing the keyboard and mouse with natural voice commands.
Sasikala C., Rupalakshmi M., Ahammad S., Meghana U. (2024)	Developed a voice-assisted email system with STT and TTS modules.Feature	Enabled users of different literacy levels to access and manage emails completely through speech-based.

III. 3.METHODOLOGY

The existing voice-based email systems are designed to assist visually impaired individuals in accessing, reading, and composing emails through voice commands. Users can accomplish definable and imitable actions without using their hands and HAVs through the application of basic speech recognition and text-to-speech technology's fundamental speech scripting systems and text-to-speech systems functions , and users can do very limited tasks related to the function of emails. However, most of the current solutions rely on Internet-based voice APIs that provide limited and single-language speech recognition, usually English. The most current solutions lack fundamental features and systems that provide the basic requirements to construct and provide a complete, secure, and user-friendly experience, such as face-based authentication systems, speech recognition technology functioned on multiple languages, and systems of intelligent correction of texts.

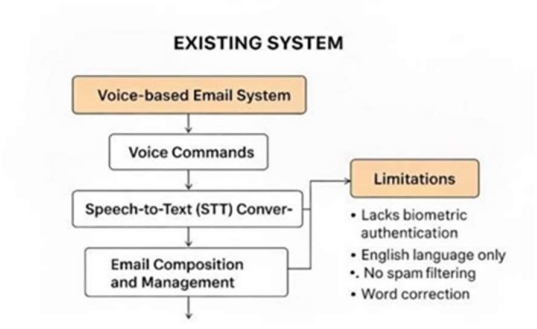

Fig 1: Existing System

Speech Input:

Users can give voice commands to the system, because the system uses a microphone to capture voice commands. Users can say commands like 'read my emails' or 'compose a new mail' or 'send mail' to give commands to the system'.

Speech-to-Text (STT) Conversion:

When given a command, the system uses a speech recognition engine (like Google Speech API or CMU Sphinx) to interpret the command. The system first transcribes the speech into text, then performs the requisite email function. Nevertheless, several contemporary systems have trouble with variation in accents and regional languages, leading to lower accuracy for users who speak Kannada or some combination of dialects.

Email Processing:

The text goes to an email processor that talks to email servers using IMAP or SMPT. Based on the command that gets processed, it fetches emails, prepares emails. or sends automated replies. Most systems today use APIs offered by Outlook or Gmail.

Text To Speech Cpnversion:

After the desired task has been completed, the system says, “You have five new messages,” or “Email sent successfully,” and the TTS engine transforms the responses into voice outputs. This allows customers with vision limitations to hear system responses without needing to see a display.

Interactive Voice Response (IVR) Guidance:

Some systems incorporate a basic IVR module that guides users through a sequence of voice prompts. For example, it may ask, “Do you want to read your inbox or compose a new mail?” While this improves navigation, it still requires users to remember certain keywords or commands

METRICS FOR EVALUATING RESULTS:

1. Accuracy: Formula:

   Accuracy= $(TP+TN)/(TP+TN+FP+FN)$

   Where, TP = True Positives, TN = True Negatives,

   FP = False Positives, FN = False Negatives.

2. Precision: Formula:

   Precision = TP / (TP + FP)

   Meaning: Out of all items predicted as positive, how many are truly positive. Example: In a spam filter, precision shows how many emails marked spam are actually spam.

3. 3. Recall (Sensitivity):

   Recall = TP / (TP + FN)

   Meaning: Measures how many actual positives the model correctly identified. Example: In a spam filter, recall shows how many spam messages were actually spam.

4. F1-score:

   F1 = 2 * (Precision + Recall)

   How: It takes both precision and recall into account. When can it be used: It is useful in the case of data being imbalanced (ex: more normal emails than spam).

New System

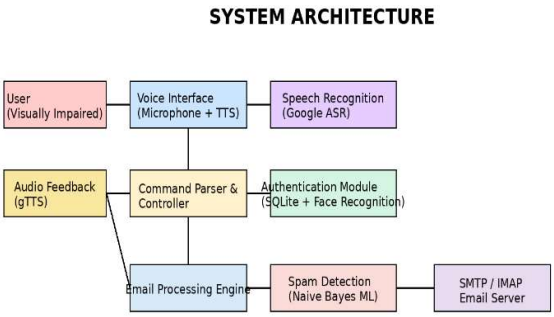

Fig. 2. Architecture of AI-based email system integrating speech, face recognition, and hashing for secure authentication.

Reasoning for User Authentication:

In most systems, the passwords required for the most basic of account protection often are the weakest lines of protection, particularly for password protected email accounts. Biometric authentication systems such as simple voice or images are even more simple to breach, which leave the systems open for exploitation.

Generated Output Response:

In these systems, audio feedback is provided to communicate the final result, such as reading an email aloud or confirmation of an email sent. It is possible for the visually impaired to use email systems without visual contact with the systems. However, the systems remain deficient in several advanced functionalities, including real-time grammar and spell checking, bidirectional language support, and spam detection strategies utilizing AI.

Limitations of the Existing System:

- Restricted to English-only communication,

with no regional language support.
- Lacks face recognition-based authentication, depending solely on passwords.
- Does not include automatic word correction for speech errors.
- Limited interactivity — users must follow fixed command patterns.
- No intelligent spam filtering or priority message sorting.

IV. 4.Conclusion

While the existing voice-based email systems get the job done and have positively impacted digital inclusivity for handicapped people, there are major flaws in accuracy, security, and language versatility of these systems. Efforts to improve these voice-based email systems are very much needed. The email system that has been proposed integrates Kannada–English Speech-to-Text (STT) functionality, AI-driven spam email recognition, accuracy correction, and secure facial-blended authentication, addressing the challenges described above. Collectively, these systems provide visually handicapped people with a safe and unique communication system.

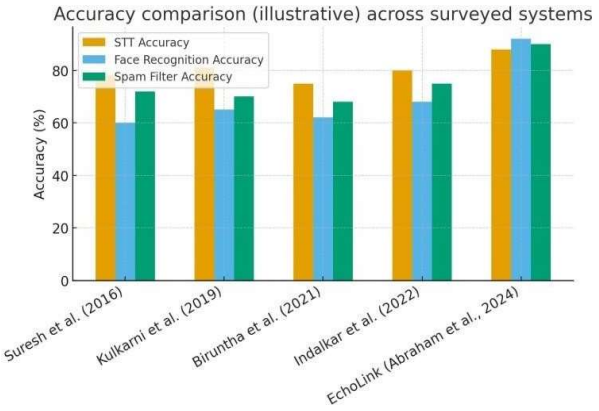

Fig. 3. Accuracy comparison (illustrative) across surveyed systems

Table 2. Accuracy comparison across surveyed systems

Author	STT_Accuracy_%	FaceRec_Accuracy_%	SpamFilter_Accuracy_%
Suresh et al. (2016)	78	60	72
Kulkarni et al. (2019)	81	65	70
Biruntha et al. (2021)	75	62	68
Indalkar et al. (2022)	80	68	75
EchoLink (Abraham et al., 2024)	88	92	90

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