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A SYSTEM OF COMMUNICATION VIA MAIL DESIGNED FOR VISUALLY IMPAIRED

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Abstract: Computer technology has enabled the development of various solutions that facilitate access for the visually impaired, and our team has created a desktop application that enables them to send and read emails like everyone else. Our innovative VMAIL system architecture utilizes the Python platform and incorporates "text-to-voice" and human speech recognition features, making it easy to send and receive emails using a computer. Despite the widespread use of the internet and its services, accessing information and utilizing online resources can be challenging for those with visual impairments. Computer-based accessibility technologies have increased opportunities for people with visual impairments worldwide, and virtual environments based on aural feedback, such as screen readers, have significantly enhanced the accessibility of internet applications. Our proposed sound recording concept offers a simple and accessible method for people with visual impairments to send emails.

Index Terms **– visually impaired, vmail, text-to-voice.**

I. INTRODUCTION

Email is an essential tool for communication in today's world. It enables individuals and organizations to exchange information and collaborate with others across different locations and time zones. With the rise of remote work and globalization, email has become even more crucial in facilitating communication and productivity. It allows people to send and receive messages, share files, and manage their schedules and tasks. In addition, email has also become a platform for marketing and advertising, enabling businesses to reach out to potential customers and promote their products and services. As technology continues to advance, email will likely remain a vital tool for communication and collaboration in both personal and professional contexts.

Individuals who are visually impaired often face difficulties using postal services that are an integral part of daily life for many people. To make these services accessible, various technologies such as screen readers, automatic speakers, speech-to-text and text-to-speech, Braille keyboards, and more have been provided. However, these technologies are not always effective for the visually impaired since they do not provide the same level of feedback as traditional methods. Voice-based email is a solution that aims to make it easier for visually impaired individuals to send messages effectively.

The system utilizes two essential modules, Text-to-Speech and Speech-to-Text converters, allowing users to manage their emails using voice commands. The system provides voice instructions to the user, and the user responds accordingly. The Speech-to-Text module helps the user to write emails effortlessly by converting speech to text. The Text-to-Speech module provides voice output of text messages, reading out the sender, subject, and text of the email. Additionally, the system aims to provide accessibility services for other applications such as "My Computer," "Word," and "Notepad.

II. LITERATURE REVIEW

1.Tetra Mail, A Practical Email Client for the Blind

Publication Year: March 2020

Authors: Akif Khan, Shah Khusro, Badam Niazi, Jamil Ahmad, Iftikhar Ala,Inayat's

There is a critical communication and collaboration tool for individuals who are blind or have low vision. However, the inconsistent interface design, unspecified navigation equipment, various screen sizes and navigation, complex input methods, and insufficient haptic feedback in email on smartphones cause several problems. Visually impaired individuals also face challenges accessing hidden parts of touch interfaces to perform email-related tasks such as sending, receiving, joining, deleting, filtering, searching, and managing spam. As a result, they encounter difficulties not only while operating smartphones but also when performing email-related tasks. Spam and information overload can also be annoying. To address these issues, we developed Tetra Mail, a user-friendly email client that overcomes the accessibility and usability issues related to email-related activities on smartphones. We evaluated the email client through a survey of 38 visually

impaired participants in 14 email campaigns. The results showed a better user experience, increased accuracy, and better control of the touchscreen interface while performing essential email management tasks. Overall, Tetra Mail is an easy-to-use email client that enhances accessibility and usability for individuals with visual impairments.
Cons : Does not focus much on web surfing for the visually impaired.

2. Intelligent Voice Mail (Vmail) Application Based on Human-Computer Interaction- Assistant for Visually Impaired Users
Release Year: 2020
Posted by: Sherly Noel

The emergence of technology has brought about significant changes in communication, particularly in email communication, whether formal or informal. With the advancements in technology, opportunities have been created for people with visual impairments. This application aims to simplify the process of email writing, not only for the visually impaired but for everyone. The use of voice commands instead of keyboard input eliminates the need for extra skills required for writing. The application recognises the user's voice and compares it to a sample before recording the speech in a file and executing the command. The focus is on reducing the burden on human memory. The main objective of this project is to develop a system for text-to-speech (TTS) and speech-to-text (STT) email writing and reading. The application uses the Google Web Kit API for speech recognition. During a comprehensive evaluation, the application performed exceptionally well, surpassing several key aspects such as listening, speech, speed, and words per minute.
Cons: can use improvements like fingerprint reader instead of using email id and password to authenticate users. This is expensive.

3. Voice-Based E-mail
Publication Year: September 2022
Authors: Dr. S. Brinda, Ms. D. Priya, Mr.S. Mukesh, Bay C. Dinesh Kumar, R.K. Naveen.

Computer-based accessibility technologies have greatly benefited visually impaired people globally, especially through virtual environments based on audio feedback such as screen readers. However, the use of such systems has not been widely accepted in many countries, particularly in the Indian subcontinent, due to the need for different technologies for Indian languages compared to other widely used languages. In this article, a voice recording system is presented that enables visually impaired people to easily and efficiently send and receive emails based on audio input. This research contributes to the advancement of accessibility technologies for visually impaired individuals and the design was found to be more efficient than existing graphical user interfaces.
Cons: You cannot send email with attachment here, just send email and read email

4. Voice-Based Email System Using Artificial Intelligence
Issue Year: April 2020
Posted by: Rijwan Khan, Pawan Kumar Sharma, Sumit Raj, Sushi Kr.

Therefore, the author proposed a voice-based e-mail system using AI for the blinds. Accessibility is the most important factor considered when designing this system. Any system is effective only if it is robust and can be easily used by people with disabilities.
Cons: Does not support attachments. It can only be done in a specific language.

5. Speech-Based Email System for the Visually Impaired
Published Date: 13 June 2019
Posted by: Pranjal Ingle, Harshada, Kanad, Arti Lanke

That sounds like a useful and innovative solution to the problem of accessing and using email for visually impaired people. By incorporating sound recording and AI technologies, the system can offer an alternative and more accessible method of communication for those who might otherwise struggle with traditional email interfaces. It's great to see advancements in computer-based accessibility technologies, which can help to create a more inclusive society and improve the quality of life for people with disabilities.
Cons: Does not support attachments.

III. METHODOLOGY

3.1 SYSTEM ARCHITECTURE : The system architecture described in Figure 3.1 consists of a flow that begins with the Google Text-to-Speech system speaking out the basic options to the user. The user can then give voice commands, which are recognized by the system, and the corresponding command is executed. The architecture may include additional components, such as a speech-to-text module for converting the user's spoken commands into text, and a text-to-speech module for reading the contents of emails to the user.

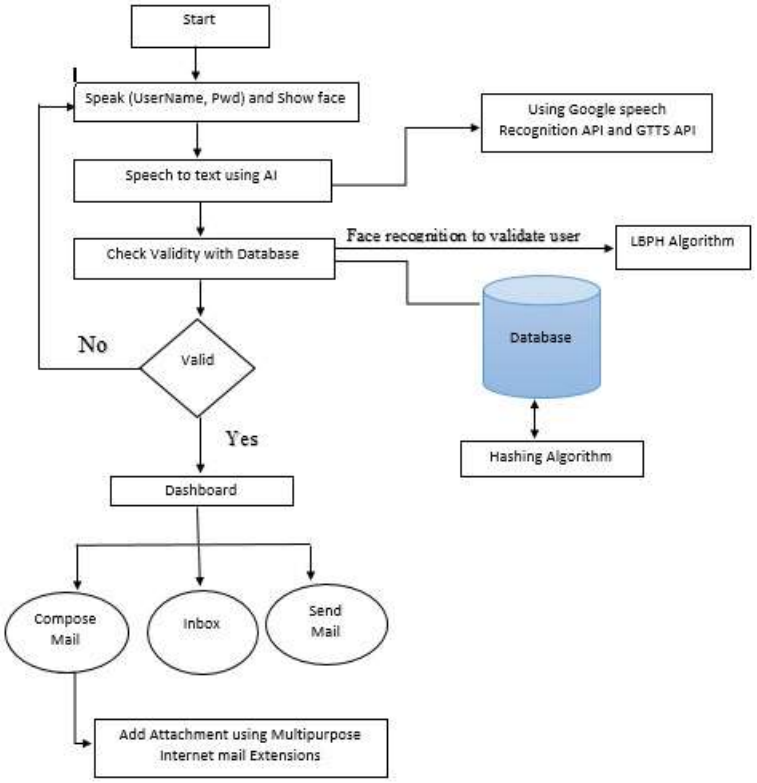

Figure.3.1. System Architecture

3.2 ALGORITHMS :

1. Haar cascade Classifier for Face Detection :

Each stage consists of many different Haar features. Each feature is classified by a Haar feature classifier. The Haar feature classifiers generate an output which can then be provided to the stage comparator. The stage comparator sums the outputs of the Haar feature classifiers and compares this value with a stage threshold to determine if the stage should be passed. If all stages are passed the face candidate is concluded to be a face. There are numerous distinct Haar traits in each step. A Haar feature classifier categorises each feature. The stage comparator can receive the output that the Haar feature classifiers produce. To evaluate if the stage should be passed, the stage comparator adds up the results of the Haar feature classifiers and compares the result with a stage threshold. The face candidate is declared to be a face if all phases are successfully completed.

2 .Local Binary Patterns Histograms: The LBP feature vector, in its simplest form, is created in the following manner:

1. Divide the test window into cells in 1. (eg.G. 16 x 16 pixels per cell)..
2. Evaluate each cell's pixel in relation to its eight neighbours (upper left, middle left, left, right, etc.).
3. Circle the pixels in either a clockwise or anticlockwise direction.

- In cases when the average pixel value is higher than the pixel value next to it, type "0". If not, type "1". An 8-bit binary number is produced (usually arithmetic converted for convenience).
- Determine the frequency of each "number" in the cell's histogram (eg., the combination of each pixel smaller than the mean and greater than the center). This histogram can be seen as a feature vector with 256 dimensions.
- The histogram may be optionally normalised.
- Concatenate the (Normalized) histogram of each cell junction. The full window's eigen vectors are provided via this.

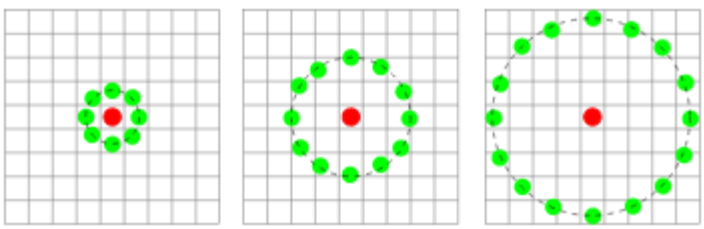

Figure.3.2. Local Binary Patterns Histograms

3.3 Module Description :

1. Data Collection
2. Building and Training of Face recognition model
3. Face Recognition
4. VMail Interaction

1. Data Collection: We capture our own face dataset, we collected 200 face images from at least one user to recognize face .
2. Building and Training of Face recognition model: In this model, we use the Haar cascade classifier algorithm to identify faces from the collected data, and then we use the LBPH face recognition model to train the model .
3. Face Recognition: In this model, when the user logs into an email system, the face is captured by the camera and verified using the LBPH classifier .If the user's face matches, the system will go to another page and show the invalid username.
4. Vmail Interaction :
   - Registration: The system's first module is registration. To obtain their own username and password, each person who want to utilise this system must first register.
   - Login : This is the system's second module. The user can log in to the system once registration is complete. The user will be prompted for their username and password via the login module.
   - VMail Application: After a successful login, the user will be directed to the main menu. Now the user can do what the user wants to do from this page. The available options are:
     - Read Inbox
     - Compose
     - Logout

IV. RESULTS AND DISCUSSION :

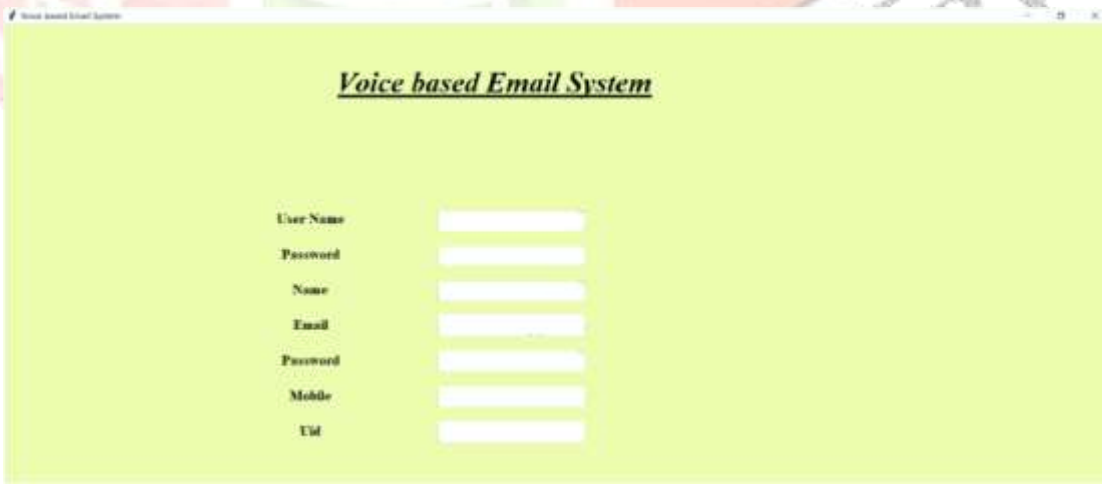

Figure.2. Registration Page

This is the registration page where the user provides the following information from a voice command to sign up for an account .

Figure.3. Face Authentication Page

This is face authentication page, user logs in via face authentication and then works on email. Only if the face is recognized then the user can login to system and access the mail else the user cannot access the mail.

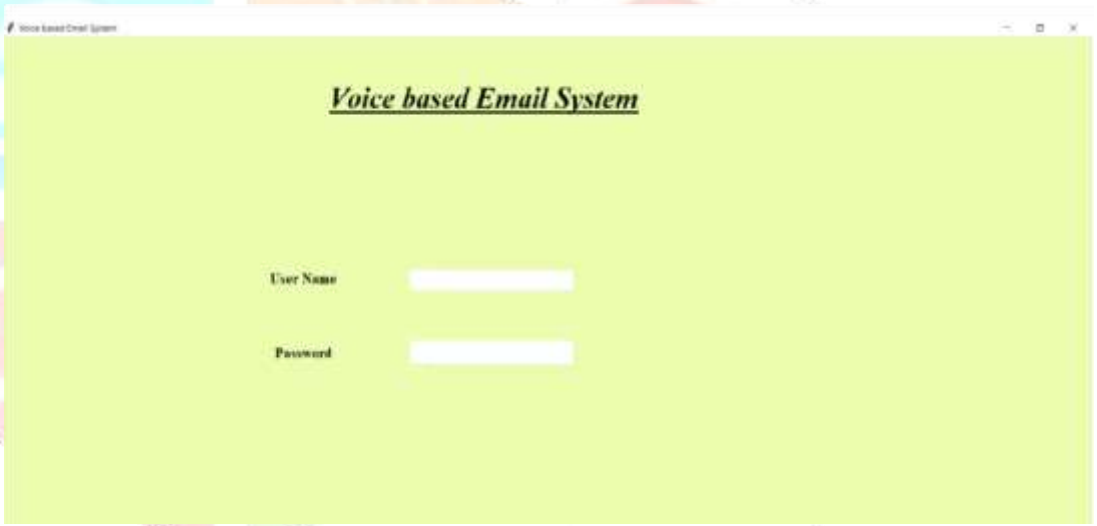

Figure.4. Login Page

This will be the output of the login page provided to the user. The user must click anywhere on the screen, which will lead to success, and take the following steps in order to access the user's email account, get the username and password.

V. CONCLUSION

This paper describes a voice-based email system for visually impaired persons.It assist visually impaired users in composing and sending emails via voice commands. The system was designed to be easy to use and accessible, with a user-friendly interface and simple voice commands. Our goal was to make email communication more accessible and efficient for visually impaired individuals, who often struggle with traditional text-based interfaces. By using voice commands, we hoped to provide an alternative method of communication that would be more natural and intuitive for blind users. Our text-to-speech and speech-to-text modules were designed to accurately convert voice commands into text and vice versa, allowing visually impaired users to compose and send emails using only their voice. The voice assistant was also designed to provide guidance and feedback, helping users navigate the system and complete tasks more easily. Overall, our project aimed to improve the quality of life for visually impaired individuals by making email communication more accessible and efficient.

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