

Voice Based Email System for Blind People

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Abstract

There are approximately 2.2 billion people who are blind or visually impaired in the world today. Emails are used to communicate critical and time-sensitive information. For a lot of visually impaired people, communication is difficult. Visually impaired people feel that they are more challenged than ever because technology is developing so quickly. The proposed system aims to develop an email system that would enable even untrained, visually impaired individuals to use communication services. This system involves the integration of voice recognition technology and natural language processing to enable the system to interpret and respond to user commands accurately. The user will only be able to utilize the mouse and speech-to-text conversion without using the keyboard. This system can also be useful for people who are not blind but have trouble reading. The system is user-friendly because it is dependent on interactive voice response.

Keywords: Speech-to-text converter, IVR (Interactive voice response), GUI (Graphical User Interfaces), SR(Speech recognition), GTTS (Google Text To Speech), and NLP(Natural Language processing).

1. Introduction

The speed at which technology is developing makes life easier for humans by enabling them to do most jobs faster and more accurately. One of the professions that have gone to the next level as a result of technological developments and the accessibility of the Internet is communication [4].

Technology improvements have reduced the distance in communication. One of the most dependable and widely used means for transmitting important information is email; to utilize the internet, a person must be able to see. Because they can't see the screen or keypad,

millions of blind or visually impaired people are unable to use the internet. They are effectively cut off from email and the internet in this way. These blind people cannot use the present email system. Consequently, individuals are unable to use current systems since they are unable to send and receive emails, as well as view the content transmitted via email. The internet is ineffective to persons who are blind since it requires the ability to read what is displayed on a screen. A visually impaired person may not always be able to rely on a third person, as sometimes the information may be private and requires to maintain integrity. As a result, to assist these people and develop the society, the authors have devised this concept, which allows a visually impaired person to send and receive emails using voice commands rather than a keyboard or a visual [5].

Even though an existing system is user-friendly, it is not as comfortable for a visually impaired individual to use a computer for the first time as it is for a typical user. Despite the fact that there are numerous screen readers available, certain minor challenges still exist for these users. Screen readers read out whatever is on the screen, and to carry out those operations, a user must use keyboard shortcuts because the screen reader cannot track the mouse's location [4]. This has two implications. First, it means that the user cannot utilise the mouse cursor since it would be extremely uncomfortable. The user should also be familiar with the layout of the keyboard and where each key is [7].

In the proposed system, Natural Language Processing (NLP) and Speech Recognition Leveraging advancements in natural language processing and speech recognition, email systems can be developed to understand and interpret spoken commands accurately. This would enable blind users to control their email accounts through voice-based interactions, making the process more intuitive and user-friendly. As a result, the usage of the mouse and keyboard is eliminated.

2. Materials and Methods

This system uses Python speech recognition and GTTS (Google Text to Speech) library, as well as other essential libraries. In this system, the Tkinter program is used. This program takes advantage of the system provided through voice input from the microphone [2]. Login, email sending, and receiving are all accessible to those who are blind or visually impaired. Here, a dataset of 250 samples were examined using information contained about blind people, including their names and Gmail accounts.

3. Module Description

This system has four modules. They are: 1. user login, 2. GTTS and speech recognition, 3. compose an email, and 4. check your inbox.

3.1. User Login

A person who makes use of a computer or network service is called a user. Here, Figure 1 shows how a user logs in. The system uses a username to identify a person who frequently has a user account. The user needs to get authenticated in Gmail with a username and password [7]. The user will be registered with a username and password for this application, and they have to provide the username and password of their own Gmail account for further login. It provides a user-friendly GUI (graphical user interface) environment [6]. Figure 3 illustrates how a user logs into the system.

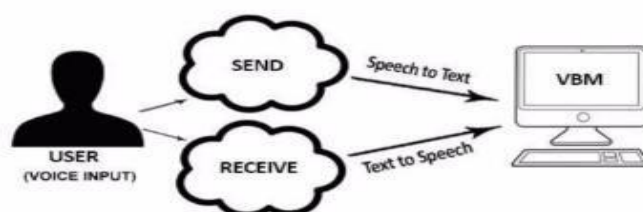


Figure 1. User Login with Credentials

3.2. GTTS and Speech Recognition

GTTS (Google Text to Speech) starts by taking input text and processing it. This may involve tasks like normalizing the text, removing punctuation, and splitting it into smaller chunks if necessary. The processed text is analyzed linguistically to determine the appropriate pronunciation of words, taking into account factors like context, grammar, and language rules [9]. Figure 2 below illustrates how speech recognition functions.

Natural Language Processing (NLP) can be used in conjunction with speech recognition to enhance the accuracy and effectiveness of the system. Natural Language Processing (NLP) techniques, such as n-gram models or more advanced approaches like transformers, can be used to build language models. These models estimate the probability of a particular word or sequence of words occurring in a given context. By incorporating language models into speech recognition, the system can leverage NLP to improve the accuracy of speech-to-text conversion

[8]. NLP techniques can be employed to perform error correction in speech recognition output. Post-processing algorithms can analyze the recognized text and apply grammatical and contextual rules to correct any errors or inconsistencies. This can enhance the overall quality of the transcriptions generated by the speech recognition system.

Acoustic modelling is responsible for converting audio signals into a sequence of linguistic units, typically phonemes or sub word units. From the audio data, various acoustic features are extracted. These features capture the spectral characteristics of the speech signal and serve as input to the acoustic model. The extracted features and corresponding transcriptions are used to train a statistical model [10]. The model calculates the probability of each linguistic unit given the acoustic features. The decoding process searches for the most likely sequence of linguistic units that best matches the audio input. The output of the acoustic model is combined with the language model to generate the final transcription. The language model helps in resolving ambiguities and improving the accuracy of the recognized text [11].

Both GTTS and speech recognition systems employ advanced algorithms to achieve their respective functionalities.

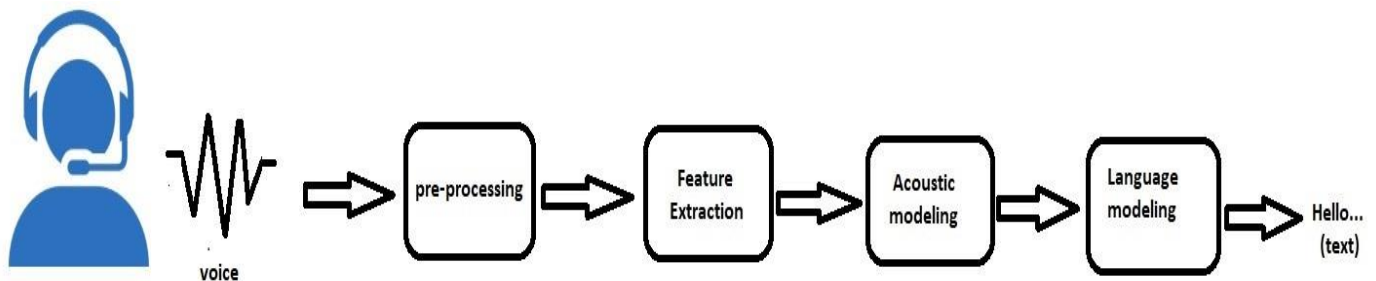


Figure 2. Process of Converting Speech to Text

3.3. Compose an Email

The user must choose option 0 to compose emails. Three inputs are used while writing an email: the recipient's email address, the email's topic, and the email's text. Once the user has provided the necessary vocal inputs, speech recognition, and GTTS (Google Text to Speech) models are used to gather data and process the email to the recipient. Figure 4 defines how the mail has been sent through the voice.

3.4. Check your Inbox

The user must choose option 1 to read emails. Email modules to read if there are any in the user's email; read the unread messages. The system will read each email in a message if there are any unread emails in it. Figure 5 shows the output of the inbox for unread E-mails.

4. Results and Discussion

To send emails, the sender must authenticate himself by providing his Gmail username and password. The topic and text of the email can be written before it is sent to the recipient. the study mainly utilized the GTTS (Google Text To Speech) module for text-to-speech conversion, the smtplib library to send mail to any internet-connected devices, BeautifulSoup a python package for parsing the HTML and the XML is used for pulling data out of HTML files, the email library provides the structure of email, pygame library provides an interface to use multimedia applications such as audio.

According to the experimental findings, using a microphone for an extended period might cause timeout errors. As a result, a brief input is required for the experimental assessments.

- Once the user logs in to the system, the following output is acquired:

```
PS C:\Users\VISWANATH\Desktop\project> & C:/Users/VISWANATH/AppData/Local/Programs/Python/Python39/python.exe c:/Users/VISWANATH/Desktop/pr
oject/main.py
You are logging from : VISWANATH
0. composed a mail.
1. Check your inbox
Your choice:
ok done!!
```

Figure 3. Login through User

- Displaying the message that the mail has been sent through the voice.

```

PS C:\Users\VISWANATH\Desktop\project> & C:/Users/VISWANATH/AppData/Local/Programs/Python/Python39/python.exe c:/Users/VISWANATH/Desktop/project/main.py
You are logging from : VISWANATH
0. composed a mail.
1. Check your inbox
Your choice:
ok done!!
result2:
{ 'alternative': [{'confidence': 0.74050409, 'transcript': 'zero'}],
  'final': True}
You said : zero
Your message :
ok done!!
result2:
{ 'alternative': [ { 'confidence': 0.88687533,
                    'transcript': 'hi hello nice to meet you'},
                  {'transcript': 'hi hello nice to meet'}],
  'final': True}
You said : hi hello nice to meet you
Congrates! Your mail has send.

```

Figure 4. Sending an Email

- Displaying the output to check your inbox module.

```

PS C:\Users\VISWANATH\Desktop\project> & C:/Users/VISWANATH/AppData/Local/Programs/Python/Python39/python.exe c:/Users/VISWANATH/Desktop/project/main.py
You are logging from : VISWANATH
1. composed a mail.
0. Check your inbox
Your choice:
ok done!!
result2:
{ 'alternative': [{'confidence': 0.74589735, 'transcript': 'zero'}],
  'final': True}
You said : zero
Number of mails in your inbox :[b'3']
Number of UnSeen mails :('OK', [b'2'])
From: The Google Account Team <google-noreply@google.com>
Subject: Venkata, take the next step on your Windows device by confirming your
        Google Account settings
Body :--0000000000000037b105f32f171b
Content-Type: text/plain; charset="UTF-8"; format=flowed; delp=yes
Content-Transfer-Encoding: base64

```

Figure 5. Checking Inbox for Unread Emails

5. Conclusion

The voice-based email system for blinds is a highly innovative and essential system that seeks to provide visually impaired individuals with a more accessible and efficient email communication system. The Research has put together a strategy that will assist those who are apparently incapable of utilizing the benefits of email communication. The system will enhance the independence and productivity of visually impaired individuals. This structure will assist in removing a few obstacles that the visibly impaired person previously encountered when trying to access communication. Additionally, any inexperienced consumer who has no idea

where the keys are located on the console need not worry, as assistance usage is eliminated. Instead, the consumer may handle information through vocal input..

Messaging isn't a big deal for those who can see, but since it interferes and poses severe problem with so many activities for people without vision,. Given that people in a stupor can understand it, this voice-based email system is a great applications. So in the future, there is a possibility to extend the project by adding modules like junk mail and deleting mail etc . - friendliness, there will be a permanent elimination of mouse usage.

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