Voice Based Email System for Visually Impaired

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Abstract
Voice recognition is one of the fastest emerging technologies which applies artificial intelligence for practical purposes. Also the existing email system is almost the sole medium for electronic communication of formal nature. Hence this paper explores the option of creating a voice based email system and the results obtained by it.

Key Words: Voice recognition, email system, visually impaired, python, speech recognition, pyttsx3

1. INTRODUCTION

Email systems are the life-line of modern day formal communications, and with its legacy of several decades it is nowhere close to being obsolete. Hence it is easy to understand that everyone irrespective of their occupation has something to gain out of it. However when we move out of the domain of people with normal abilities to the domain of people with special needs due to visual impairment in this particular case-study. We see a major lack of suitable alternatives for people with special needs. In fact the modern web page design methodologies which is supposed to make web pages more interactive actually prove to be a major hassle for the visually impaired.

2.1. AIM AND OBJECTIVE

In the elementary system proposed here the following objectives would be the guidelines directing the progress of this project.

1. The system must be easy to implement, tangible and flexible in approach so that it can be easily deployed from the average hardware used by users.

2. The system must not require extensive development process involving super specialized development teams.

3. The system must be completely voice based such that the use of intricate input devices must is completely unnecessary.

4. The system must be able to seamlessly work with common email domains such as gmail.com, yahoo.com etc. This must be ensured to preserve simplicity of setup and smooth integration with the rest of the email systems present in most of the workplaces.

2.2. SCOPE OF PROPOSED SYSTEM

The proposed system would be functional to the following extends-

- The system would be able to accept email id and login password orally from the user.
- The system would then be able to synchronize itself with the email servers.
- The system then would ask the user whether he/she would like to compose an email
- The email body would be accepted orally by the application.
- The system would then ask the user for the recipient's email address and then ask for final confirmation.

3. LITERATURE SURVEY

The topic of making technology accessible for blind users has been a long standing topic and there is a wealth of informationand research available regarding this, Hence in the following section we would take an overview of some available systems and break down their technicalities and analyses their features and shortcomings if any.

Jagtap N et al [2] in the paper Voice Based System in Desktop and Mobile Devices for Blind People have done a commendable job in creating a system architecture which uses a hybrid of both voice based commands and hardware based gestures. In this particular system the authors have tried to create an entire mini-operating system which includes multiple applications for different activities. However the systems described here is a major device based implementation and is not particularly suitable for small narrow applications like email systems. The system unfortunately suffers from the same problems which major encompassing systems have like requirement of specialized hardware and each device requiring its own unique implementation.

Ummuhanysifa U., et al [3]. In the paper Voice Based Search Engine and Web page Reader follows a unique approach in providing internet access to blind users, instead of designing a new system the authors have proposed the addition of an external application to common browsers and applications. This particular approach is novel due to the fact that it makes integration of voice based system with day to day applications a matter of “plug and play”. This particular paper focuses on search engines based on voice recognition and further goes into the analysis of different voice recognition systems and their respective abilities in terms of accuracy of speech recognition and handling of unforeseen events.

This paper is particularly useful for choosing the right speech recognition engine and making speech recognition better by implementing various techniques like noise cancellation.

T.Shabana, et al [4] in the paper Voice based email system for blinds have presented a complete system which relies on voice based responses and mouse inputs. This is a marvelous system as the system implemented by the authors is capable of performing all the major operations that one would need to do while dealing with emails. Furthermore this system recognizes the drawbacks of simply using screen readers and rectifies them by using a purpose built prompting system. Also this particular implementation pays attention to the fact that blind users cannot make precise mouse maneuvers and hence it gives the user the freedom to click anywhere on the interface, only relying on the number of clicks. The only apparent issue with this system is that, that this system is not based on currently used email servers like Gmail, yahoo etc. And is dependent on a local device for database services.

Cole, Ron, et al [5] "The challenge of spoken language systems: Research directions for the nineties."
This is one of the pioneering papers which talks about the paradigm shift of transforming from conventional system to voice based systems. This paper also discusses all the possible scenarios while dealing with computer based interactions and what must be our focus in developing such ambitious technologies. It also issues very useful guidelines which are applicable for any voiced based system and ensure that the system performs as expected and the overall transition is smooth for engineers working on integrating voice recognition in daily appliances and also the general public towards who are the target consumers of such appliances.

4. PROPOSED SYSTEM

In order to accomplish the objectives the system being proposed here is a voice based email system which would be created using only open source software freely available on the internet and it must also use simple programming practices to implement its features.

The system must also be usable on majority of machines without the need for any major particular hardware, in short the system must be hardware independent.

This system has been designed as a simple email interface which can be easily controlled by using voice input. The user is first asked for the email and password by the system, the user then orally inputs this information. The system then synchronizes itself with the email servers with the data provided. The system would then ask if the user would like to compose a new mail or browse through their inbox. The inbox option allows the user to check the mails that has been received, the system will read out the information of the body and subject to the user by sending those information through the libraries and hence converting the text into speech. If the user decides to compose a new mail then the subject, body and receiver's email address is asked by the system. All these voice inputs taken in by the system are sent through the speech recognition module, where this speech is converted into text by using some existing libraries. The system then takes these information and brings back its feedback, this is then converted back into speech for the user to listen. For this purpose the text to speech module has been used. It converts all the information provided as text into speech by using libraries. These are some of the particulars of this project.

The libraries used by the system for detection and recognition of information are the online free to use libraries. The language of choice for implementing the project was python. Python has a very expressive syntax which allows for reducing the bulkiness of the code, keeping it short and precise and hence making a production and testing process efficient.

5. SYSTEM METHODOLOGY

The following diagram indicates flow of operations in the proposed work:-

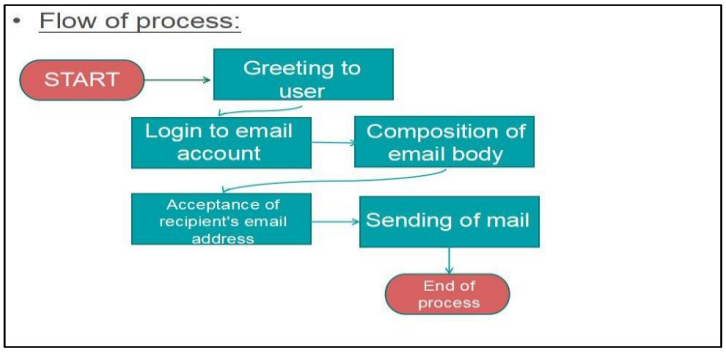

Figure 5.1-System methodology

The following table explains all the processes involved in proposed system:-

Process	Process description
1.Greeting to user	The system asks the user's name and says hello to the user.
2.Login to account	The system asks the user for their login credentials, verifies them and logs into their email account.
3.Composition of email body	The system prompts the user for the heading and body of the email and records them.
4.Acceptance of recipient's address	The system prompts the user for the recipient's email address and checks if the given address exists and is valid.
5.Sending of email	The system asks for final final confirmation and sends the email. Later it notifies whether the email was successfully sent or not.

Table 5.1-Project processes

6. DESIGN AND IMPLEMENTATION

The following diagram explains the system architecture:-

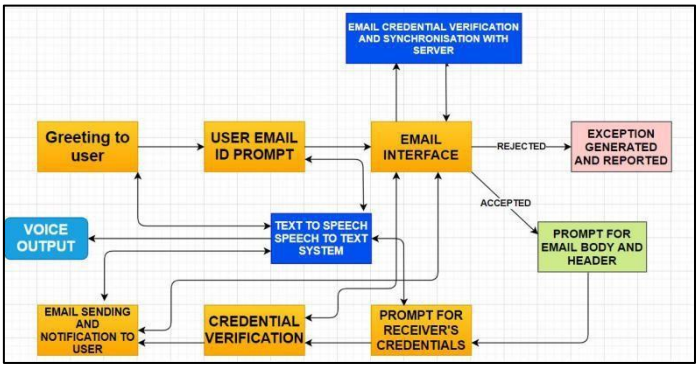

Figure 6.1-System architecture

6.1. ARCHITECTURE MODULES

Architecture module	Description
1.Text to speech unit	This unit converts text to spoken speech.
2.Speech to text unit	This unit converts speech to text on the fly using google's speech recognition service.
3.Email interface unit	This unit synchronises and verifies email addresses with email servers,

Table 6.1-Architecture modules

6.2. LANGUAGE FOR IMPLEMENTATION

- For implementing this project the language of choice was python.
- Due to its very expressive syntax which allowed for reducing the lines of code and making production and testing process much more efficient.
- Also the presence of large number of application based libraries makes this a lucrative choice for such projects.

6.3. LIBRARIES USED

Name of Library	Purpose of Library
1.speech_recognition	for converting speech to text.
2.smtplib	for interfacing with the email servers.
3.pyttsx3	for converting speech to text.

Table 6.2-Libraries used

6.4. DETAILED DESCRIPTION OF MODULES

- **Speech recognition module**
  - This module is responsible for recognizing the speech being input from the system microphone.
  - In this case we are using the google speech recognition engine as it provides us with the best results.
  - If required the recognized speech can also be stored as a text and used later on.
- **Text to speech module**
  - This is the second major module in this system.
  - This uses the pyttsx3 library for transcribing the system prompts to speech.
  - The speech output of this module can be altered as per the convenience of the user to different accents.
- **Email interface**
  - This unit uses the speech acquired from the above modules to compose an email.
  - Also this unit uses encryption facilities in order to safely transmit and receive emails.
  - Use of this module simplifies the program implementation by abstracting how the computer communicates with the email servers.

6.5. LIMITATIONS OF PROPOSED WORK

While implementing this system the following limitations were encountered:-

1. Lack of privacy

- This system by design requires the user to clearly speak out the user id, password and email body.
- This presents the inherent issue that nearby people may overhear this information and hence compromise integrity of communication.

2. Lack of accuracy

- Though voice recognition systems are much better than what was available several years ago but still there is always the chance of miss-recognition of words.
- And in this case this may prove to be a major detriment when the type of communication is urgent or very important for the user

3. Presence of ambiguities

- Even the today the popular voice based systems require some amount of manual input to be present mostly for starting or stopping the system, this may prove to be inconvenient for the user.
- However a completely voice based system may will present many ambiguous situations where it would

be difficult to determine when the system should be listening or when it should be deactivated.

4. Insufficient resources

- Voice recognition and its implementation in various utilities is something that requires rigorous research and testing.
- Such operations often demand significant amount of financial resources as well as other research tools.
- This lack of resources often impedes research work and leads to production of very specialized systems which are not economical neither are they widely and easily available.

7. EXPERIMENTATION AND RESULTSOBTAINED

```
PS C:\Users\Mohit> python -u "c:\Users\Mohit\Desktop\minidemo.py"
[0x7FF8EC7C6970] ANOMALY: meaningless REX prefix used
Sender's Email ID : miniprojectdemo100@gmail.com
Password : minidemo
Login Successful !
Receiver's Email ID : miniprojectdemo200@gmail.com
Subject: testing
Message: this is a testing mail
Success : Email sent !
PS C:\Users\Mohit>
```

Figure 7.1-email sent confirmation

Figure 7.2 - test email sent (inbox view)

Figure 7.3-Test email received (receiver's inbox view)

```
PS C:\Users\Mohit> python -u "c:\Users\Mohit\Desktop\minidemo.py"
[0x7FF8EC7C6970] ANOMALY: meaningless REX prefix used
Sender's Email ID : miniprojectdemo100@gmail.com
Password : minidemo
Login Successful !
Receiver's Email ID : miniprojectdemo200@gmail.com
Subject: testing
Message: this is a testing mail
Process Cancelled!
```

Figure 7.4 - Confirmation of mail sending failure

8. CONCLUSION

In conclusion we can say that this email system is another attempt for creating viable email sending alternatives for visually impaired users.

This current implementation was able to achieve the followingdirectives:-

- A cheap and widely accessible system was created using free and open source software.
- The system was considerate towards the special needs of blind users.
- The system is compatible with all major operating systems.

And this implementation was able to execute the following functions as speculated:-

- Acceptance of email id and password by voice input.
- Synchronization with email servers on demand.
- Prompting the user for required inputs.
- Voice input based email body composition.
- Sending of email and asking for confirmation.

As with anything new the current implementation has some limitations in during voice recognition due to the use of general non-calibrated speech recognition engines, however this can be rectified by using well trained voice recognition models.

Further on the reach of this system can be further extended by making it compatible with mobile devices and the corresponding operating systems seamlessly.

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