Voice Based E-mail System for Visually Impaired: A Review

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Abstract - *As the technology is enhancing, people are coming more closer to digital life and digital communication. There are many ways to communicate with others through internet in this new advanced era. Most of them are choosing the easiest way of communication i.e., Electronic mail (E-mail). E-mail is the technology that enables user to contact with others by sending mails and also helps in business world communication. There are people who cannot use these technologies because either they are illiterate or do not have ability to see the screen. So, to make this technology closer to visually challenged people, authors proposed a Voice Based E-mail System. This system provides them the facility of communication and make them much stronger and independent. This architecture will help blind people to access e-mail and other multimedia functions. Leaving behind the old techniques, this voice-based email system will be containing new technologies that will be easily acceptable by visually challenged people.*

Key Words: IVR, Speech to text converter, Text to speech converter, Voice based email, Visually challenged people.

1.INTRODUCTION

Internet is the most essential part in today's world of communication. Emails are further important way of communication that widely used in the business world. This technology has been useless for the incapacitated and oblivious people. There are around 260 million visually challenged people around the globe according to a survey. That also means these people are unaware of how to use internet or e-mail and about new advanced technologies [4]. The solution to this problem has been in a way that either there should be third person which is not visually challenged to help them in reading and sending mails or to use screen-readers, braille keywords etc. Braille keyboards proved to be useful but not sufficient enough to perform high level operations [5]. These ways are not correct to deal with this problem and also had drawbacks.

This application uses text to speech (TTS) and speech to text (STT) converters so that visually challenged people can operate the system easily. This system reduces the complexity to remember the characters or information regarding keyboard shortcuts. Every function will be based on simple voice commands so that those people could easily make use of the technology. The model will also help blind people to become independent and strong as they will be able to communicate without the help of third person.

1.1 Module Description:

a) Speech-to-text Converter

Speech-to-text converter helps as to obtain input for the system. When a person speaks through microphone and is recognised by the system, the speech is then converted to text. Our speech to-text system directly obtains and converts speech to text. It helps the visually impaired people so that they can control the whole system by giving input as speech and no need to worry about keyboard shortcuts or screen readers. In Voice based email system, the users speak the username, passwords for logging into the system and also when users choose actions to be performed like displaying inbox, sent mails, compose mail etc. Speech recognition systems can be divided into several blocks: feature extraction, acoustic models' database which is created based on the training data, dictionary, language model and the speech recognition algorithm.

b) Text-to-speech Converter

Text-to-speech converter helps in obtaining output from the system. When any operation occurs in the system the resulting output is in text format but it is useless for visually impaired people. So, the text is then converted to speech and is heard by them. It is very useful as it does not require pressing keyboard shortcuts or anything else for outputs displaying. In Voice based email system, when the user gives instructions to read the inbox mails or sent mails then the text-to-speech converter converts the text in mails into the speech and is understood by user. Text-to-speech is also used on devices such as portable GPS units to announce street names when giving directions.

c) IVR (Interactive Voice Response)

Interactive Voice Response (IVR) is an advanced technology that shows the interaction between the user and the system which responds by using keyboard for the respective voice messages. It performs functions and enables users to interact with email host system through keyboard. Then IVR dialogue comes into play and users can easily enquire. These systems respond with pre-recorded audio voice that provides the path to the user and assist it in preceding. The pre-recorded audio must contain large volumes.

d) Speech recognition

Speech recognition is the ability of a machine to recognize words and phrases that are in spoken language. Then it converts those words and phrases into machine-readable format. Rudimentary speech recognition software has a limited vocabulary of words and phrases, and it may only identify these if they are spoken very clearly [4].

In figure 1, the flowchart displays the basic functions of the proposed model. It describes the flow in which first the user is categorized as new or existing user. The new user has to register himself and then proceed to login system. Now the registered or existing user will login using username and password. It further proceeds to inbox which consists of mail checking or composing. It enables STT and TTS for easy access of mails and then the user logout from the system.

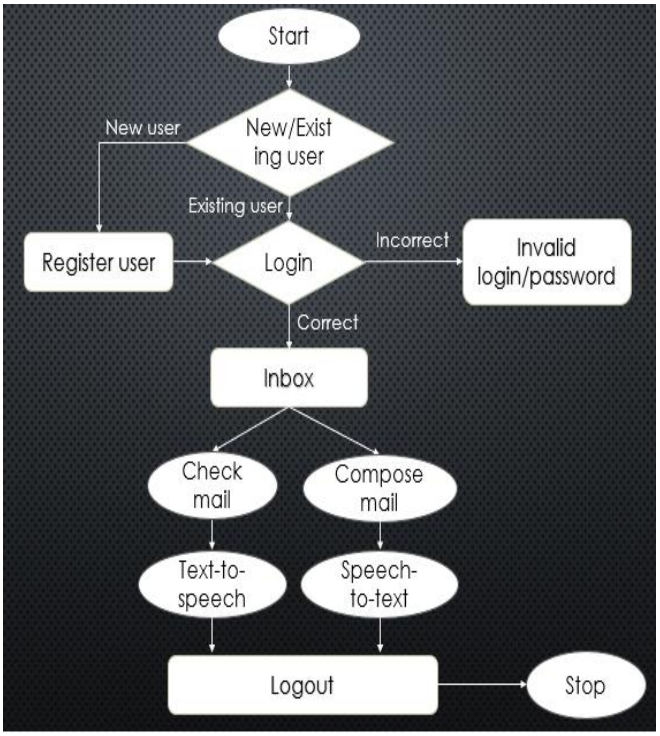

Figure 1: Flow Chart

The given proposed system comprises of mainly three designs i.e., UI Design, Database Design and System Design. In the UI Design we mainly design the webpages by the help of HTML and CSS3 that are used by the users for interaction. Then comes the Database Design, we can say by name only that it is important as it is having all the records, credentials of various users and admin. Its main aim is user authentication and storing mails. The System Design consist of mainly two modules, they are TTS & STT module and Mail Programming Module. In the Mail Programming Module, we use SMTP method to transfer mail from one user to another.

2. LITERATURE SURVEY

Several contributions have been made for visually challenged people so as to give them accessibility in the field of communication via E-mails. Following are the technologies of each paper:

Recently in 2020, Voice based email system was proposed to overcome drawbacks of traditional ASR and screen reading systems as shown in figure 2 & 3[1]. The system consists of advanced features so that blind people can operate easily. It consists of Login module as first module and validating the login credentials. The client then moves to home module after signing in and following choices are available there: Inbox, Create, Sent mail and Junk. IVR technology is used in PC Program design and STT(Speech-to-message) and TTS(Text-to-discourse) is also used. The proposed system also makes use of mouse click events [1].

Figure 2: Screen Readers [1]

Figure 3: ASR [1]

In paper [2], the authors proposed Voice based email system by linking the application with Google's Gmail. Traditional systems provided their own user developed email services. The system consists of (a) Speech-to-text Converter (b) Text-to-speech Converter. The application makes use of SMTP protocol for sending emails and POP3 protocol for receiving emails. Accuracy of speech-to-text is low as there is a need to train it. It is a desktop application that can be used by illiterate and handicapped people also. The proposed system not only ensures the user's data security but also give users a sense of secure mailing.

In paper [3], the authors have proposed the email system that can be used by visually impaired people easily. System design consist of three modules: TTS(Text-to-speech) module, STT(Speech-to-text) module and Mail Programming Module (Compose, Inbox and Sent Mail) module. In this system Speech-to-text is done using Artificial Intelligence (AI) through API involving neural network models provided to developers by Google Cloud Speech-to-text. Also, it uses various Hashing Algorithms (MD5, SHA) to store passwords or other credentials in database by converting them into hash functions which results in higher security than traditional systems. The process of using hashing algorithm is shown in figure 4 [3].

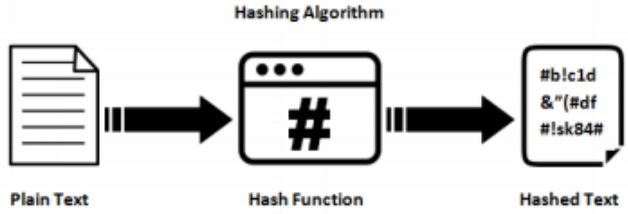

Figure 4: Hashing Algorithm [3]

In paper [4], Four main technologies are used in proposed Voice based email system:

- STT
- TTS
- IVR
- Speech Recognition

The user solely follows directions given by the system and uses voice commands. The proposed architecture provides more features than existing GUI. Java programming language is used in the system. Also, fingerprint scanning technique is proposed in the system.

In paper [5], Speech based email system is proposed for both blind and illiterate people. Instead of traditional technologies like IVR that uses screen readers and braille keyboards, the proposed system uses speech-to-text and text-to-speech conversions. Along with STT and TTS API, PhpMailer and Php-IMAP is used for sending and fetching mails. For searching mails in inboxes, pattern matching algorithm is used. So, in this system Knuth-Morris-Pratt algorithm is implemented.

Voice based email system in paper [6] contributes in such a way that enables blind people to send and receive voice-based email messages in their native language. The architecture of this system performs much better than that of existing GUIs. It can be operated on both computer and mobile devices. Java language is used in the proposed system. It also consists of three main modules these are: (a) Speech-to-text converter (b) Text-to-speech converter (c) Word Recognition.

In paper [7], the proposed email system provides registration module firstly that helps in logging in by entering username and password. Also, user's voice gets recorded and stored in database. After this, the main app page shows the options of inbox and compose which is guided through IVR technology. Generally, Adobe Dreamweaver CS3 is used in User interface designing as it is the advanced method. There is contact us page where the user can suggest any suggestion.

Advantages of the techniques that is used in most of the papers: The process of speech-to-text and text-to speech makes the system more interactive and easier for the visually impaired people. The system makes the blind people feel like normal users. Also, these systems can be useful for handicapped and illiterate people. According to survey, major useful technique is automatic-speech recognizer. It is seen that load taken on blind is reduced as they need not to remember characters in keyboard. It shows Voice based email system is a user-friendly system.

Disadvantages/Limitations of the techniques that is experienced in all the papers: In many systems, mouse clicks are used for some tasks which gets difficult for visually impaired people. It is also seen that only few languages (mainly English) are used in the system. There should be other languages so that the user becomes more comfortable.

3. CONCLUSIONS

This paper is the proposed Voice based Email system for visually impaired people, which helps blinds and handicapped people to access mails easily. It provides a voice-based mailing service where the visually impaired person could read and send mail on their own. It builds confidence and the user gets independent as they do not need help of others. System has eliminated all the concepts and overcome all difficulties that were in traditional methods that were faced by the visually impaired people. These voice-based e-mail systems can also be used by illiterate and handicapped people as the TTS & STT technologies benefit them. The paper gives outline about the various technologies used in different papers and marks the advantage and disadvantage of the technologies used so that the paper gives view to new technologies.

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