International Journal of Future Generation Communication and Networking
Vol. 13, No. 2s, (2020), pp. 1280–1283

A Review On Voice Based E-Mail System For Blind People Using Braille Language

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Abstract

In past few years, technology has become one of the important necessities of everyone's life. Now a days everyone knows how to use computers, laptops, smartphones etc but not everyone can use it efficiently. This case can be seen with visually impaired people who cannot use computers and other tools, so they have to be dependent on other people for the same. Email system is one of the most important services one needs in daily life. So, this voice based Email system is built so that blind people can use the email services independently. These systems use Speech to Text and Text to Speech converters for the conversion of speech to text and vice versa. Automatic Speech Recognition (ASR) is used for recognising the speech of the user to take the input. Some systems also use screen readers for displaying the output on the screen using speech synthesis or Braille display.

Keywords*: IVR, ASR, screen readers, STT and TTS converter, speech recognition.*

I. INTRODUCTION

Now a days, technology is being used at its maximum extent where social media, email system, science etc. still capture the important places. But, not everyone can use these facilities efficiently because of different reasons. Visually impaired people face this problem a lot as they cannot use keyboard, see the screen or anything related to computers. They are dependent on other people for using the mail facilities like for composing mail, viewing the received emails, deleting mails etc. The existing systems are working on keyboard actions, mouse clicks[1], screen readers and voice commands. They are not fully voice command based but partially work on voice commands like recording voice while sending messages. Mouse is also one of the key hardware devices that was involved in this kind of systems as it worked on the operations defined by the developer as mentioned below:

- Single right click: Compose Mail
- Single left click: Check Inbox
- Mouse scroll up: Select next mail
- Mouse scroll down: Previous mail

Screen readers were also used as they enabled visually impaired people to read their messages on the screen via Braille language. But this could not be implemented by the developers completely. People also had to rely on keyboard or mouse clicks for operating the system which could increase the complications for their use.

So, there must be some technique that would not cost much and still, be completely user friendly. Here the user is a blind person, so the criteria of user friendliness would be fulfilled if they are able to use this email system completely on their own. This could really help a lot of blind people as this system would help them to become independent in case of using technologies like this.

ISSN: 2233-7857 IJFGCN

II. LITERATURE REVIEW

The voice based email system for the visually impaired people has been given many attempts of implementation and it was done in many different ways with different techniques.

The "Voice mail architecture in desktop and Mobile devices for the blind people" was published by TirthankarDasgupta et.al. in 2012. They used ASR(Automatic Speech Recognition)[1][4] for voice recognition of the user. ASR is the use of computer hardware and software based techniques to identify and process human voice. ASR is primarily used to convert spoken words into text. They also used Text to Speech(TTS)[1][6][7][8] and Speech to Text(STT)[1][6][7][8] converters for text to speech and speech to text conversation respectively.

The "Voice based system in desktop and Mobile devices for blind people" was implementation of JagtapNilesh, Pavan Alai, ChavhanSwapnil, Bendre M.R in 2014. This implementation was totally based on various operations of the mouse clicks[2][7]. Screen readers[2][6] were used for interpreting the text and displaying on the screen in braille language. It also included voice feedback[2].

The "Voice based Interactive System for Visually Impaired" was implemented by Sadaf Abdul Rauf et.al. in the year of 2016. They also used ASR[1][4] for speech recognition. They used a new technique called Hidden Markov Model(HMM)[4][7]. HMM did not play the important role but was used to enhance the system and to make it more efficient and speaker independent. Further they also tried to use dictation pads[4] for increasing the recognition rates but it also gave rise to some problems as the age of the speaker was also affecting the recognition rate due to the difference in the pitch of their voices.

"Voice Based E-Mail System for Blind People" was an implementation of Dhanashree D. Zope, et.al.in 2017. They used Interactive Voice Response(IVR)[5][6] which is an advanced technology that allows user to interact with an email host system via system keyboard. These systems usually respond with pre-recorded voice as an output to user, to assist them which needed large volumes.

"Voice based email system application for blind and visually impaired people" was implemented by SwapnilKurhade, Laxman Gore, Ketan Salve in 2017. In this paper, STT(Speech to Text) and TTS(Text to Speech) converters were used. Speech to text converter is an application which converts the speech into text similarly, text into speech converter is an application which converts the given text into speech. It also involved the use of screen readers[6] and IVR[5][6]. This system also used MFCC(Mel Frequency Cepstral Coefficient)[6] for automatic speech and speaker recognitions. In sound processing, the male frequency cepstrum is a representation of the short term power ceptrum of a sound, based on a linear co-sine transform of a log power ceptrum on a non linear Mel scale of frequency.

"Voice based email attachment for visually challenged people" was implemented by Tharani K K, Shalini R, Jeyathi I, Dr. Deepalakshami R, in 2017. This system was also based on mouse clicks[2][7] and also worked on speech input for sending and receiving mails. They also tried HMM[4][7] for their implementation. This system gave the facility to attach the files ie. the files attachments[7] while sending emails.

The "Voice based email for blind people" which was implemented by K Jayachandran, P Anbumani in 2017. It used TTS[1][6][7][8] and STT[1][6][7][8] for text to speech and speech to text respectively. This system also gave alert message[8] and delivery messages[8].

III. DISCUSSION

The results of these systems were great for their use by blind people but also had some problem or the other. No existing system was efficient enough to fulfil all the expectations, which a blind user would

ISSN: 2233-7857 IJFGCN

want from a system that would connect it with technology directly and to use different functions where we majorly focused on email systems. The advantages of the previous systems can be seen as under:

- User's speech is recognised in order to take the input from him/her.
- Speech is automatically converted to text and vice versa.
- Voice based feedback is possible in some of these systems.
- Some also offer output on the display with Braille display called the screen readers.

There are also some drawbacks of the existing systems. They are listed below:

- Systems are speaker dependent.
- They are not completely voice command based.
- Only some systems offer vocational feedback.
- Systems which used Braille printers are very costly as these printers are expensive.

IV. CONCLUSION

Many conventional and unconventional approaches like LVCSR, IVR, HMM, screen readers, dictation pads, Braille printers(for output) were adapted to work with these voice based systems but all had their utilisations and some came along with their disadvantages. These systems can be used by visually impaired people and would help them a lot in order to become independent while using such important applications like email services. These systems are also cost efficient but some systems are expensive which involved external devices to be taken with them like Braille printers. So, the existing systems are very useful as they fulfil the cause of their development but also need some modifications in order to be used completely without any hassle.

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