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A Comprehensive Survey of Voice Based Email System Strategies for Blind People

[1] Sanchita Singh*, [2] Brajesh Kumar Singh, [3] Lavkush Sharma

[1] Department of Computer Science Engineering, Raja Balwant Singh Engineering Technical Campus, Agra, UP
Corresponding Author Email: [1] sanchitasingh0000@gmail.com

Abstract*— Today, technology is advancing according to wisdom. This tool is only available to general users, making it difficult for visually impaired users. Just like any normal user, using the available techniques requires some practice. The aim of this application is to create a voicemail that blind can easily use. It has been observed that blind people in India constitute about 60% of the total blind people in the globe. The sound design described in this article can be used to make email accessible to non-visual users as well as visually impaired people. This design also reduces the keyboard work for blind users. The biggest attraction of this job is helping the disabled and illiterate. Voicemail works on conversational response, which is very useful for users who do not have access to regular email applications. IVR supported systems often work with an input audio that allows the user to continue. Use high volume during pre-recording and recording.

Index Terms: API (Application Programming Interface), MD5 (Message Digest Algorithms), SHA5 (Secure Hash Algorithms) and LBPH (Local Binary Pattern Histogram).

I. LITERATURE REVIEW

The Internet is widely recognized as an important source of information. Modern society, most communication takes place online. Email has completely replaced text as the standard for communication. In recent years, the use of voice technology has proven to help users easily access their applications or websites. Therefore, based on research data, the system generates and generates useful projects that provide the best solution to the problem using recognizable words and links. Research shows that people with disabilities generally have limitations.

II. MOTIVATION

Speech-based email is designed for blind users to use email easily and securely. A voice-based architecture for email systems that allows blind users to use the system without security tension.

III. LITERATURE SURVEY

In this paper, the authors show that the speech synthesis capabilities built into the VMAIL system can read aloud, preventing blindness. Web development using HTML and Java. It can be used as an assistive device for the visually impaired. Users can listen and speak messages to other voicemail users. Voicemail users have an additional advantage over other voicemail in that it reduces stress by allowing users to read emails.[1].

In paper, advances in computer-aided technology have provided many opportunities for the majority of visually impaired people around the world. Virtual environments based on screen readers which are very useful for blind people to use web applications However, in many countries, especially the Indian subcontinent, most visually impaired people cannot benefit from these systems. This paper describes a sound system that can be easily and effectively used by people with visual impairments [2].

In the research paper, the authors show that the most basic email systems we use in our daily lives are unusable for people with visual impairments and are not audible to blind people. Just like other users, people with visual impairments cannot use computers as easily, even if they are experienced users. Ask the user to read every word that appears on the screen. Because the text cannot follow the pointer position, users must use keyboard shortcuts to perform certain tasks. Therefore, users who are new to computers cannot use this service because they do not understand the basic procedures [3].

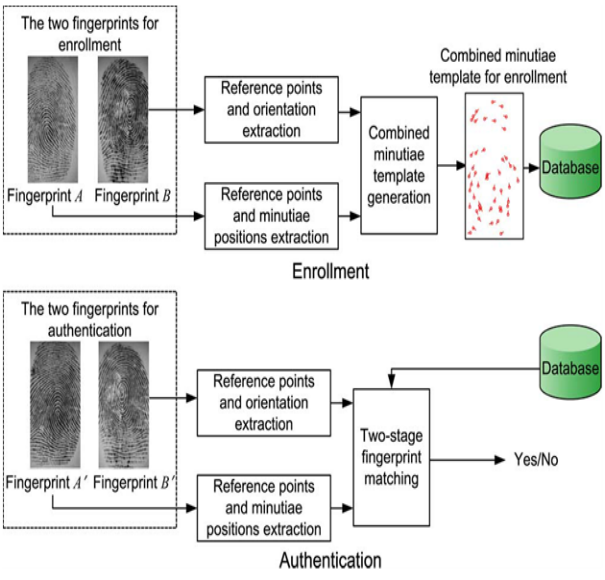

Fig. 1. Fingerprint privacy protection system[3]

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FIG 1 shows that the system requires two identical fingers to register. The two-stage fingerprint matching technique is used to match two fingerprint problems in mixed granularity patterns. Even if all your information is stolen while entering your card information, your finger information will not be affected or altered. Additionally, the similarity in topology makes it difficult for an attacker to distinguish between fine-grained and fine-grained patterns. Using existing fingerprint reconstruction techniques, the improved pattern can be converted into a similar fingerprint. So it creates new virtual fingers for two different fingers. The goal of the paper's author is to make a system that can easily be accessed by blind people. For added security, the system uses voice recognition to authenticate users. It uses speech recognition technologies such as Mel Frequency Cepstral Coefficients (MFCC) and Dynamic Time Warping. [4].

In this paper, the Internet has become a space of relaxation in people's daily lives. Everyone can access the Internet. However, the visually impaired have difficulty using this information and using online services. Advances in computer services have opened many doors of opportunity for people with visual impairments around the world [5].

In this paper, the author aims to create a mobile-based email system that helps blind communicate via email. The application works solely with the user's voice, allowing the user to communicate with the world. The system can store text, images, audio, video, etc. [6].

In this paper, the author advises people who are blind or have low vision to use email correctly. Modules include a TTS module, STT module, and an email composition module (e.g. Text, Inbox, Send). We use speech-to-text mining in the cloud using an API that uses neural network models that Google provides to developers [7].

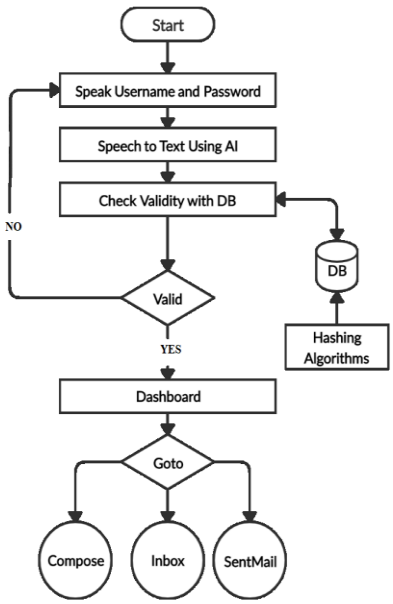

Fig. 2. Flowchart of user system [7]

FIG 2 shows that users must first register with the application system through the registration form. Users will be assisted by voice commands, and any sections requiring registration will be announced on the site and closed when the user speaks. Once the registration process is complete, users can log in by entering their credentials if required. Your credentials are converted from voice to text and used to verify your identity. Once you successfully log in, you can access various areas such as writing messages, mailbox, and sending messages. One way to keep your passwords safe is to save them as their original passwords in an immutable format. This method is called hashing.

In this paper, the authors argue that voice-based virtual environments, including screen readers and various voice search systems, make it easier for people to blindly access the Internet. This study tries to explain the working of a speech system that blind can use to access email quickly and efficiently. This research helps listen and speak the emails [9].

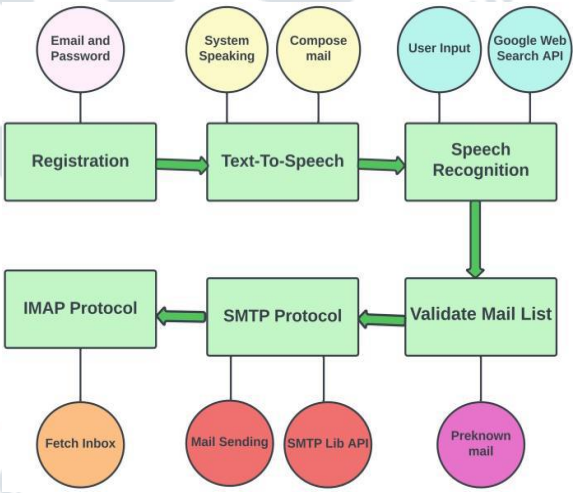

Fig. 3. User system flowchart [9]

FIG 3 shows that if the user is not authenticated, he or she must first log in and then register to enter the control panel. Now he wants to write an email. SMTP is a system used to send email addresses to other users on the Internet. From the client's perspective, protocols which are used to receive email like Post Office Protocol (POP) and Internet Message Access Protocol (IMAP). When you send an email, you have a signature and text. Clients and servers respond to several requests when sending email. The difference is that the title stops when a blank line appears. Your body language conveys the same message as when you answer the phone. Each in vivo data point is collected based on previous data. Therefore, the information obtained through research is incorporated into body language. All information after blank lines is taken from the text. In a later paper, the authors reported that email systems are interactive, allowing users to send messages and comments without using a keyboard or keyboard. Voice mode helps recognize your voice and voice.

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The process of converting text to text is often called "speech-to-speech" or "automatic speech processing" (ASR). Google's text-to-speech (GTTS) technology is joining the conversation. SMTP and IMAP (Internet Distribution Protocol) are the two main protocols used for email communication. SMTP is used to send emails and IMAP is used to access and manage emails. Therefore, a "blind email system" [9] model was designed and created, as shown in FIG 3.

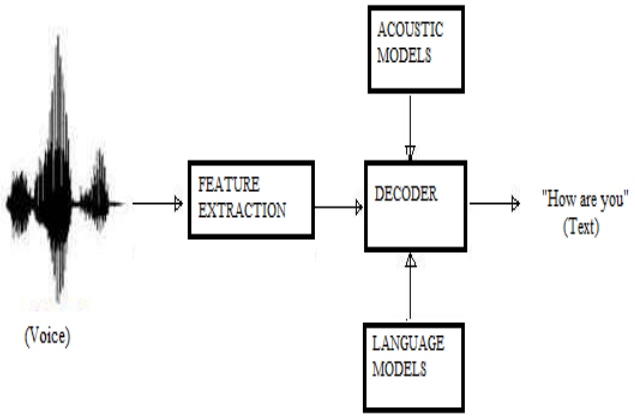

Fig. 4. Speech Recognition System [10]

FIG 4 describes training data with various records and their labels. Speech recognition models use acoustic models to capture the relationships between sounds and spoken words (such as phonemes or subwords). This helps the model understand and distinguish between speech sounds. Language simulations are used to enhance the language learning process by incorporating specific language skills. Linguistic patterns help AI technology make more accurate predictions about words or phrases depending on the context. Multi-language support Google TTS, including but not limited to multi-language support: English, Spanish, French, German, Italian, Japanese, Korean, Portuguese, Russian.

IV. COMPARATIVE ANALYSIS

Table I: Compare Research Papers Techniques and Securities.

S.No	Techniques Used	Goals	References
1.	Interactive Voice Recorder, Text to Speech and Speech to Text.	Enable the blind use voicemail systems through voice commands.	KVN Sunitha (2010) [1], Amritha Suresh (2016) [4], Tharani K K (2017) [5], Anshika Rajput (2019) [6], Rijwan khan (2020) [7], Mullapudi Harshasri (2021) [8], Malavika Arun (2022) [9], Dr. K Badrinath (2023) [10], U Akshita (2020) [14], Sakshi Talke (2021) [15], Rahul Kumar (2022) [18], Ranjana Vyavahare (2023) [19], Aishwarya Belekar(2020) [22], Parkhi Bhardwaj (2020) [23], Kavi Prakash N (2022) [24], Viram Jain (2021) [26], C.Venkata Sai (2023) [28] and Gagana M (2023) [29].
2.	Automatic Speech Recognition.	A secure voicemail with the help of fingerprint detection.	Tirthankar Dasgupta (2012) [2], G. Anusha (2014) [3], Anshika Rajput (2019) [6], Dr. K Badrinath (2023) [10], Dr. K Badrinath (2023) [10], U Akshita (2020) [14], Dr. S. Brindha (2022) [16], Aishwarya Belekar (2020) [22], Milan Badigar (2018) [25] and K. Jayachandran (2017) [30].
3.	MFCC (Mel Frequency Cepstral Coefficients) and DTW (Dynamic Time Warping).	Algorithms used to remove noise from the input user voice.	Amritha Suresh (2016) [4] and Ayisha Zubain Bhandari (2017) [21].
4.	Artificial Intelligence, Message Digest 5 and Secure Hash Algorithm	A secure password voice based email systemusing hashing	Rijwan khan (2020) [7] and Rahul Kumar (2022) [18].

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S.No	Techniques Used	Goals	References
5.	Text to Speech, Django, Simple Text Mail Transfer and two way handshake.	A secure web socket connection is created to the user's mail server.	Anshika Rajput (2019) [6] and Shreyas J (2021) [11].
6.	Dual Tone Multi Frequency, Application Programming Interface, MAX 232 and RS 232.	Design and development of a mobile interface circuit that connects a mobile signal to a computer for email reading.	Azath M. (2013) [12].
7.	Microsoft Speech Recognition, Real Simple Syndication, Microsoft Speech SDK and Local Binary Pattern Histogram.	Design and development a secure voice based email systemusing face recognition.	Omkar Kulkarni (2019) [13], Onkar Indalkar (2019) [17] and Ranjana Vyavahare (2023) [19].
8.	Optical Character Recognition, Text-to-Speech Conversion.	Used to convert and speak the text in attachments like images and documents.	Sakshi Talke (2021) [15].
9.	HMM (Hidden Markov model) and Algorithm Viterbi	It is used for voice recognition and detection.	Hari Priya S L (2015) [27].

Table 1 compares the strategies researchers have used for audio emails for the visually impaired. It is not enough for a system to function correctly. You also need to make sure it is safe. Voice email systems are secure because they use a minimum keyboard or mouse and instead use voice commands and speech-to-text. Voice recognition is a more secure type of biometric authentication than traditional login because it requires the user to interact with an identifier rather than simply entering numbers. The security of voice authentication can be further strengthened through continuous voice authentication, unique password, and multi-factor authentication.

Table II: Comparison of traditional and progressive email systems [20].

S No.	Traditional system	Progressive System
1.	It is less secure.	It is more reliable because it is highly secured.
2.	This systemmust use keyboards.	System relies on IVR and a minimum keyboard is used.
3.	Slow procedure (slow execution).	It is a faster procedure (fast execution).
4.	Only non-disabled persons may use this system.	Both normal users and impaired may use this system.
5.	Blind people cannot use normal email systems easily.	The mobile-based application E-mail systemenables blind interaction (using speech).

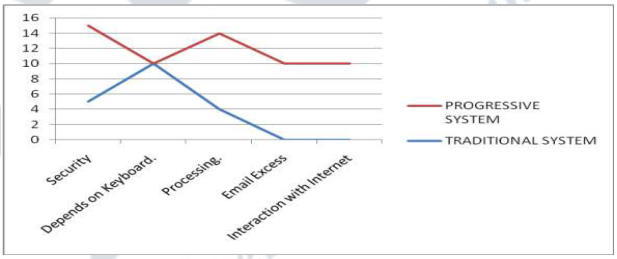

Fig. 5. Results with comparison study [20].

This graph (FIG 5) shows the size of email compared to traditional systems. The X-axis measures various parameters such as keyboard stability for all input types, reliability, creativity, and accessibility to various products via email and Internet interaction. The Y-axis contains scores indicating better performance. Public and blind reviews are considered Google 5 parameters and have all restrictions and rules. Below are the ratings for both systems. Their ratings are compared on a scale from 1 to 15.

A voicemail for the blind that helps visually impaired easily used email. This builds trust and makes users independent because they do not need help from others. This method solves all the problems visually impaired people face when using traditional methods by removing all the components. This article describes various use cases and highlights the pros and cons of the methods used to preview new products.

The [21] authors studied speaker independent speech recognition to develop fluent speakers. Voice recognition system. Various methods, including linear discriminant, are used for feature extraction. The extracted files are used to test the system. The authors focus on discourse objects produced by independent speakers of recognized speech. This method takes different types of speech from different people and stores them in a database. MFCC can be calculated using Eq

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(1):

$$m=2595 \log10 (1+f/100)$$

Here m is the mel scale frequency and f is the perceptual frequency. Receiver signals can be calculated equally using Eq (2).

$$c(n)= ifft (log |fft(s(n)))$$

Among them, c(n) is the cepstrum signal, s(n) is the speech model, ifft is the fast Fourier transform and fft is the fast Fourier transform. MFCC combined with cubic logarithmic compression is used to produce the eigenvectors of speech and is given by Eq (3).

$$e(n)=\Sigma \log3(s[k]*cos[n*(k+0.5)] * \pi/m)$$

Among them, s[k] represents the power of each Mel window, such as M from 1 to k, and M represents Mel windows from 20 to 24. From 1 ~ n ~ L, L is the order of M. The authors tested a group of 20 subjects who recorded the sound from 0 to 9 depending on the frequency and power of speech in a rarefaction environment with a frequency of 44.1 kHz. The system turned out to be a real need. The system achieves 90% accuracy due to the use of vector quantization and is faster due to vector coefficients.

According to the survey [26] conducted on ground at an academy for the blind, blind Internet users prefer a few types of assistive technology, with screen readers (e.g., MS Narrator, JAWS, NVDA, Fusion) being the most popular. Screen readers are programmes that convert text on a computer screen into synthetic speech. Screen readers have a few disadvantages, such as producing a noisy audio interface and reading out the entire content on the screen. Searching for old mails and adding attachments while composing a mail are two other issues that the blind face when using the internet. Fig.1 below is the graphical representation of the on-ground survey that was conducted at a blind academy; over 200 visually disabled participated in the survey.

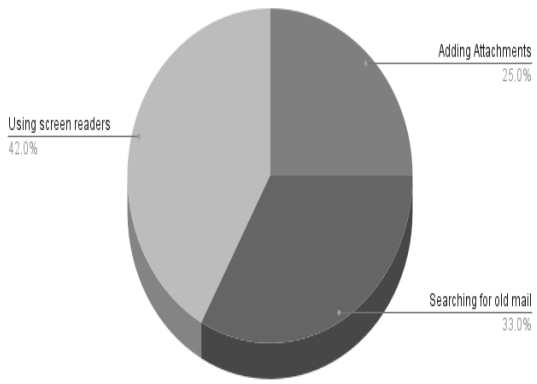

Fig.1. below is the graphical representation of the on-ground survey that was conducted at a blind academy; over 200 visually disabled participated in the survey [26].

Viterbi Algorithm [27] is a programming algorithm used to find the most probable hidden state sequence is called Viterbi path, which generates an observable event sequence, especially in the context of HMM models. This algorithm is generally used to determine convolutional codes. Nowadays, it is widely used in speech recognition and communication to determine the most appropriate words.

A. Algorithm

Suppose we are given a state space S, the probability that i is in state i, and a Hidden Markov Model (HMM) containing the transition from state i to state j. For example, Suppose, the outputs yi,...,yT. The most probable sequence of states xi,...,xT that lead to the observation is given by recursion:

V1, k=P(y1|k).πk Vt,k=max(x∈S)(P(yt,k).ax,k.Vt-1,x 1

Here Vt, k is the probability of the most probable sequence of states describing the first t observations with k as the final state. The Viterbi method is obtained by storing the parameter that remembers the state X used in the second equation. Let the function Ptr(k,t) that returns the value x used to calculate Vt,k return the value k if t> 1 and t = 1. Then:

$X_T = \arg\max_{x \in S}(V_{T,x})$

$X_{t-1} = Ptr(X_t,t)$

The complexity of this algorithm is $O(T X |S|^2)$.

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