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Enhance Voice-Based Email Web System for Visually Impaired People

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Abstract: ***In today's world, communication has become terribly simple thanks to the combination of communication technology and also the Internet. Email is one of the widely used ways of communication. However, it is difficult for the visually impaired to use this technology because it requires visual perception. Although many new advances have been made in the effective use of computers, no naive users without visual impairments can use this technology as effectively as ordinary naive users. Thus, in this study, firstly we review all the existing voice-based email systems whether it's desktop applications, websites, or mobile applications, and found some drawbacks and flaws. After that, we present our improved voice-based email system that will help even a naïve visually impaired person to use the services for communication. The system will not let the user make use of the keyboard and mouse instead will work only on voice operations and speech conversion to text. The developed system uses the PBKDF2 algorithm with SHA256 hash and provides better security while storing passwords. Also, this system can be used by any normal person. The system allows the normal user to choose between voice and normal operations to manage time efficiently. The system we developed is completely based on interactive voice response that's why it is user-friendly and efficient to use.***

Keywords: Speech Recognition, Visually Impaired People, Voice Based Email, gTTS, Python, Speech Recognition, STT, Voice Operations.

I. INTRODUCTION

The internet is considered a major store of information in today's world. No single work can be done without the aid of it. Email is one of the most ordinary forms of communication, mostly in the business world. Anyway, not everyone can use the internet This is because to access the internet you would need to know what is written on the screen. If it is not visible it is of no use. This makes the internet completely useless technology for visually impaired people. [1] The visually impaired or blind have benefited greatly from various computer systems, such as automatic text-to Braille transliteration systems [12-13] and audio feedbackbased virtual environments using automatic speech recognition and text-to-speech converter. But the systems currently available do not provide blind internet users with full efficiency. It is estimated that nearly 1.3 billion people worldwide are visually impaired, internet facilities for communication also need to be made usable.

Interactive voice response is a technology that allows computers to interact with humans through the use of voice. IVR enables customers to interact with the company's host system using a telephone keypad or voice recognition. Then you can request service through the IVR dialog box. The IVR system deployed on the network is designed to handle a large number of calls and is also used for outgoing calls because the IVR system is smarter than many smart dialing systems. The IVR system can be used for mobile shopping, bank payments, services, retail orders, utilities, and travel. Information and weather conditions. [6] In 2015, the number of emails sent and received every day exceeded 205 billion. The average annual rate for the next 4 years is 3, and it will exceed 246 billion at the beginning of 2019. [8] Also the number of global email users in 2015 was close to 2.6 billion. By the end of 2019, the number of global e-mail users will increase to more than 2.9 billion, making e-mail the most widely used method of communication. For this reason, different projects are proposed for developed a voice e-mail system that will help visually impaired people who don't know how to use a computer system to enjoy e-mail services. In this paper, we review all those present similar techniques and proposed our implemented voice-based email web system which provides better security & reduces some of the drawbacks of the existing systems. The problem with the existing desktop or web systems is that they require the use of a keyboard or mouse clicks, which makes it difficult for visually impaired people to use those systems efficiently. Also, the existing systems do not provide enough security. In most cases, passwords are stored in plain text or the existing systems use outdated hashing algorithms for storing passwords. So we implement a voice-based email web system for visually impaired people which completely eliminates the use of keyboard or mouse clicks. The implemented system uses up-to-date hashing algorithms and increases system security.

II. LITERATURE

In [1], the voice-based email architecture is proposed which helps visually impaired people to be a part of a growing world by using the internet.

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The system enables blind people to send voice mail messages, thereby reducing the heavy cognitive burden that blind people must use a keyboard or a mobile keyboard to memorize and input characters. It also Eliminates the problem of insufficient English proficiency for the blind. In this system user selection is the first module, mailing options are the second module consist of composing mail and inbox check. Accessibility is the third module consists of the text-based and voice-based messages option. In [2], the voice-based email web system is proposed which helps visually impaired people to make the life of visually impaired people quite easier. It is focused on easy button taps and voice input, and screen shortcuts are not remembered. The proposed system helps overcome some of the shortcomings that blind people faced before using e-mail. Any end-user of any age can easily use this email system. It also has the function of pronunciation-to-context and Pronunciation-to-pronunciation viewer. The first module in the system is the registration module. End users who wish to use the system must first request an end-user code and name. This module collects complete data from the end-user and tells the end-user what type of data it is. The system validates the data by reading the data entered by the end-user in alphabetical order. Logging is the second module of the system, and end-users can log in. The enduser must enter the end user name and ID to access the website. A forgotten password is the third module in the system. If authorized users forget the code and cannot log in, they can select the forgotten part of the password. The home page is the final module in the system which consists of composing mail, checking inbox, viewing send mails and view delete mails.

In [3], the voice-based email android application is proposed which helps visually impaired people. This will be entirely based on voice or speech. The user can give the system commands that the system will follow. In addition, the system will prompt the user to take certain measures to use the corresponding service. The application will be available on all Android devices and is voice-controlled. The main advantage of this application is that no keyboard input is required. All the user has to do is touch the screen to let the device receive voice input. The system has given the user the freedom to touch anywhere on the screen and speak out his inputs. The system consists of 7 modules namely registration, login, dashboard, composing mail, inbox, send emails, user info. In [4], the voice-based email web application is proposed to help visually Impaired people. The system has the functions of voice-to-text and text-to-speech using a voice reader, which means that the system is designed for the visually impaired and blind. In this system, all operations are based on mouse click events. The whole system is based on interactive IVR voice response. The function indicated by the IVR depends on the type of click. In [5], the voice-based email application for desktops is proposed which helps blind and disabled people to access e-mail easily and efficiently. Provide a voice mail service that allows visually impaired people to read and send emails without assistance. It needs basic information about keyboard shortcuts. This system consists of 4 modules namely registration, login, inbox, and composing emails. In [6], the voice-based email website is proposed which is completely different from the existing mail system. The proposed system is an alternative to the existing system, which has more functions including interactive voice response, speech to text, and text to speech. The proposed system is oriented towards reliability and ease of use. This system is developed using Viterbi Algorithm, a dynamic programming algorithm rule, which is used to uniquely determine the main sequence of the potential state, called the Viterbi path, which leads to a series of detected events. A word guessed from a specific word is pronounced by the user. When everyone becomes the same then select a word from the dictionary, and the system will type it without burdening the user. Similarly, the full text is input, and the user only needs to spell it by the system, so that blind users do not need to use a keyboard or Mouse for it. However, the algorithm rules apply to speech-to-text and text-to-speech. The proposed system consists of 2 modules namely speech to text and text to speech. A speech-to-text system receives voice and converts it directly into the text. It will complement various larger systems by providing users with different ways to enter information. Voice-to-text systems can improve the accessibility of the system by providing input options for the blind, deaf, or disabled. A speech recognition system is usually divided into many blocks: feature extraction, acoustic model information supported by training information, vocabulary, model language, and algorithmic speech recognition rules. The analog voice signal must first be sampled or digitized along the time axis and amplitude axis. Voice samples will be analyzed regularly. In this case, sometimes the 20 milliseconds due to the signal during the interval is considered to be smooth. The extraction of voice features includes the formation of different, equally spaced voice feature vectors. Information is used to estimate the parameters, acoustic model. The acoustic model describes the characteristics of the main identifiable components. Usually, an important component is a tone used for continuous speaking or words used to recognize single words. In textto-speech, the main feature of the system is to convert speech into corresponding text. When the user enters data in the form of voice, the sensor or microphone will receive the voice and use the API to translate it into text. All symbols, numbers, and symbols are translated. In [7], the voice-based email application for desktops is proposed. The newly developed system allows the visually impaired to easily access e-mail. It can be used effectively by anyone, such as normal or blind people. The system is based on Google gTTS API and speech-to-text conversion. For the visually impaired, the entire system is based on text-to-speech, which helps blind people listen to voice mails and provides text-to-speech. The blind can also receive voice messages and send messages that are converted into text. The recommended voice email application uses a device such as a microphone to recognize voice sounds. This application transmits voice through the microphone and saves the processed voice in a file. This conversion is done through Google voice recognition. The recognized text is saved in the file. GTTS (Google Text to Speech) is a Python library that can convert text to speech audio. The voice to be saved in the MP3 file is the file that is the object of the audio processing,

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The text-tospeech converter accepts any number of text characters as input. The voice processor has no restrictions and can speak any text message provided as input. Interactive Voice Response (IVR) enables people to communicate with the system via voice. These systems react to the recorded audience and guide users. It is implemented using the Python library. Tkinter is a Graphical User Interface library for Python. The easiest way is to create a GUI application that can be used to display buttons in the application. The proposed system uses the Multi-Purpose Internet Mail Extension (MIMI). MIME Base is the base class for all MIME-specific subclasses. The MIME text method is used to support and convert text into characters and sounds. Multipart MIME is used to send one or more text and non-text attachments. The recommended system consists of basic modules namely registration, login, compose, and inbox. The main part of the system is the registration page. Any user who registers with a username and password for the first time can use the system. The second part of the system is the login page. When users fill out the registration page, they can log in. Compose Mail is the most important feature of the mail system. Normal senders can send messages. This is an additional message (text only). The subject and body of the message are written in the code, and blind people can use the microphone to send emails. When a visually impaired sender sends an email, it will be saved in your inbox. This helps users/recipients to access emails sent by ordinary senders. Visually impaired recipients can listen to the voice messages of ordinary senders through MP3 files. In [8], the voice-based email application using face detection was proposed for mobiles. The proposed system enables the visually impaired and disabled to use e-mail. The system provides blind users with easy and secure access to the mail application. It consists of 5 modules namely sign up, sign in, inbox, compose and delete. First, users can take photos with voice commands through their Android phones, and then the system can authenticate users. The user will receive the email notification and the app will allow them to listen to the email. The user can compose an email by simply speaking the content, and the application will automatically convert it to text. Users can delete emails using this module. The proposed system uses the 3 algorithms called Haar Cascade Classifier, Support Vector Classification, Local Binary Patterns Histograms. It uses the Haar Cascade Classifier for face detecting. To train the classifier, a positive image containing the desired object is required. Human faces in the picture and negative images that do not contain human faces. The classifier scans the features on the positive image and creates a specific target value based on the sum of black and white areas in the object. The classifier tries to create the best-optimized target value for object detection and tracking by adjusting the size of the features. The feature is a weak classifier. Because they cannot be the correct classifier by themselves. An object has many attributes, and the place where they are collected contains the desired object in the image. Using a large number of positive and negative images makes it easier to identify objects in the image. Finding objects in images depends on the classifier training method and the number of positive and negative images. Classifier training is used to train the classifier in positive and negative images. The classifier is trained by outputting positive images according to the type. The positive is reduced to 24 * 24 pixels and converted to a vector file using a script to determine the number of positive images used in training. On the other hand, the Support Vector Machine (SVM) classifier is a linear classifier in which the divided hyperplane is chosen to minimize the expected classification error of the invisible test pattern. SVM is a powerful classifier that can identify two categories. SVM classifies the test images according to the category with the largest distance. The SVM learning algorithm creates a model that can predict whether the test image belongs to this category or another. SVM requires a lot of training data to select the limit of an effective solution, and the computational workload is very high, even if we limit ourselves to recognizing (frontal) detection. SVM is a classification learning algorithm that tries to find the optimal spacing hyperplane to minimize the expected classification error of invisible patterns. The local binary pattern histogram (LBP) feature vector divides the window of interest into multiple cells in its simplest form (for example, each cell is 16 × 16 pixels). For each pixel in the cell, it compares the pixel with each of its 8 neighboring pixels (for the upper left corner, left middle corner, lower left corner, upper right corner, etc. Follow the circle clockwise or counterclockwise If the pixel value is greater than the adjacent value, enter "0", otherwise enter "1". In [9], the voice-based email mobile application was proposed which helps the visually impaired to participate more in the work of this digital world. The application accepts input in the format of voice commands, and a voice-to-text converter helps convert voice into keyword commands. The system accepts the command and takes the required action accordingly. The output will again be audio, which is done through a text-to-speech converter. It consists of 5 modules namely registration, login, inbox, sent mail, and receive mail. Registration module allows you to register for the first time an application for which users must have created an email ID. If you enter the wrong input, the app will ask you to log in again. Registered users must log in to access the application. The login module contains the user ID and password fields. If you are logged in, you will be redirected to the main page, otherwise, you must first register in the app. All entries are made by voice. The user must provide his login data before the system can recognize voice commands. After successful registration, the user will be directed to the start page. The homepage consists of 3 parts: inbox, sending emails, and receiving emails. Every time an email is selected, the user will be asked who the sender is and what the subject of the email is. Enter that the user can listen to all received e-mails and decide whether the e-mail is important enough to be saved or deleted. Deleted emails are stored in the trash can. Since the system is designed for the visually impaired, only voice input can be used to write mail. To send a mail, the user must read the content of the mail and then say the command word "send". Once the application hears the command word, it sends an email. This option will log all emails deleted by the user. The user can delete mails from received or sent emails that he considers useless.

If users need to recover deleted emails at any time, they can do it in the recycle bin section. In [10], the voice-based email with security application was proposed. The proposed system focuses on providing basic functions such as composing, reading, sending and receiving emails, and voice interaction, which makes it easy to use each of the above functions and send messages. The system makes it easy for blind people to use the email system. Since the keyboard or mouse is not used to enter the system, users can easily enter messages by speaking to them. The proposed system is an Android application that allows blind users to access their email without third-party assistance. The first step they need for help from others is to install the app and register users. All users need to register so that users are always connected for future emails. The following methods or techniques are used to implement voice mail consisting of STT and TTS conversion in Android, API's and Keys, and Human Presence Detection System. In STT conversion Android provides options for the recognition listener interface for receiving user speech. First, create the recognizer intent. It accepts the user's voice input and guides them back to the same operation. For languages, the Android speech recognizer provides users with options to express input in 10 different languages. Then the voice response must be found in the same activity or some activity. The code converts the response into text and displays it and/or sends it back as input to the text-to-speech converter. TTS is an integral part of the application. It reads the text and converts it into sound and conveys it to the user through the user's microphone. Android introduced and supports this TTS feature, especially for the visually challenged and the visually impaired. The Android TT engine supports multiple languages. The text is passed as a parameter to the language conversion function. With the help of the listening function, the converted text will be sent to the user as an embedded voice. The system is implemented on Android. Android provides software packages such as Intent Recognition and TTS to convert these voice messages into text and text to speech. To access Gmail and Google Maps, you also need an API key. They provide web services for accessing e-mail and determining the user's current location. Human Presence Detection System [Ivanov, 19] components are connected in such a way that each time the PIR sensor detects its movement within 6 meters, the LED and the buzzer will light up, causing the LED to light up and the buzzer to start sounding. Due to the size of the sensor, many microelectromechanical components are integrated into today's smartphones. Therefore, if the size of the sensor can be reduced or an application can be developed to receive the results of the sensor as digital information and issue an alarm on the mobile phone, then it is very useful for the visually impaired to recognize the presence of people in many ways. Demonstrate the function of the motion detection sensor, but stationary people or objects cannot be detected by the PIR sensor, so the sensor must be replaced with another sensor to get accurate results. This application consists of 5 modules namely registration, compose mail, search mail and get mails. When a user uses this application for the first time, they need to register with Google to automatically receive emails from the user's account. All users must register to ensure they have an email account. You can communicate via e-mail. After registration, this page will take you to the main user interface where users can specify their own options, such as sending emails, setting alarms, finding locations, etc. In addition, it also has a phone module. When the phone number is pronounced, the phone module is activated, the user can provide the contact's name of the person he wants to call, the API connects to the call and can communicate with it, and the application connects to the user's telecommunication subsystem. The framework manages audio and video routing. The service that grants access to this subsystem has been started, and the service has been declared. The service is connected to a subsystem. As a result, the service receives when listening for command calls. The application will also look up the contact's name on the user's phone and make a call. The frame establishes a connection between the sender and the receiver. To ensure that there are no intruders nearby when using this application, the hardware configuration is optimized using a PIR sensor that detects the presence of people, Buzzer, and LED that warn users and Arduino to load the output program and organize the working. In [11], the voice-based email web application is proposed that is accessible to visually challenged people. This will be entirely based on voice commands. The user can give the system commands and the system will prompt the user to take certain measures to use the corresponding service. The main advantage of this application is that no keyboard input is required. All the user has to do is respond through voice. The system uses the MD5 and SHA hashing algorithm for storing passwords and provide good security. The system consists of 5 modules namely registration, login, composing, inbox, send emails.

III. PROPOSE SYSTEM

The proposed system is a voice-based email web system for visually impaired people. The most important part of our system is that it can be used by two people, whether it is an ordinary person or a disabled person. We implemented our system in a way that if a normal user wants to use a system or to read a mail without voice commands our system allows them to choose between voice operation and normal operations. The existing system cannot do this, so we are developing a new system, which will be of great help for visually impaired users also our system is suitable for all types of users, whether they are normal, blind, or illiterate. The computer system guides the user to the operation he wants to perform. The main advantage of this system is that users don't have to worry about using the keyboard or mouse clicks, because all operations are based on Interactive Voice Response (IVR). The proposed system also provides better security as compared to existing systems using up-to-date hashing algorithms for storing passwords.

A. Implementation

Registration is the first module of the system. Any user who wishes to use the system must first register to get the username and password. This module will collect the full user details by letting the user know what information needs to be entered. The registration is complete and the user can log into the system.

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The user will need to specify the details that the system will verify in alphabetical order and this information is stored in the database. Our system uses the **PBKDF2** algorithm with **SHA256** hash which provides great security while storing passwords in databases and required a huge amount of time to decrypt as compared to other existing systems.

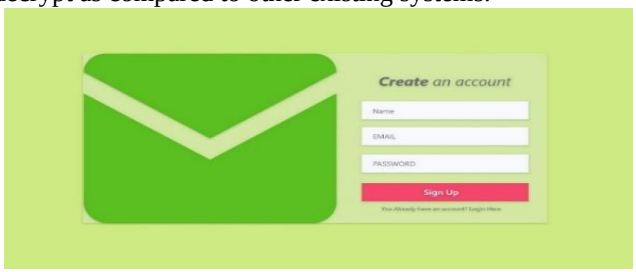

Figure 1: Sign Up

Login module performs an authentication check every time a user needs to access their account. Accepts username and password in *voice* format and converts them to text. This text is used to authenticate the user. If a user is found, then the user will be redirected to the home page. As show in figure 02. Compose email module allows users to compose the emails they want to send. This works as follows:

- The system requests the recipient's name, subject, and message body.
- The user provides this information through a speech, which is converted to text by the system.
- The system then reads the recipient's name, subject, and message body and asks for confirmation.
- When the confirmation is complete, an email will be sent to the respective recipient.

Figure 2: Sign In

Figure 3: Compose Email

Inbox option allows the user to view all mail received in their account. After selecting this option, recent emails are loaded. Then the system will prompt the recipient's name and the subject of each email, if the user wants to listen to the mail, then the user must provide the appropriate voice command. The user also has the option to delete received mail.

Figure 4: Read Email

IV. METHODOLOGY

The ASR system basically works in two stages; the first step involves preprocessing and feature extraction. The first stage performs feature extraction preprocessing, and the second stage considers acoustic modeling.

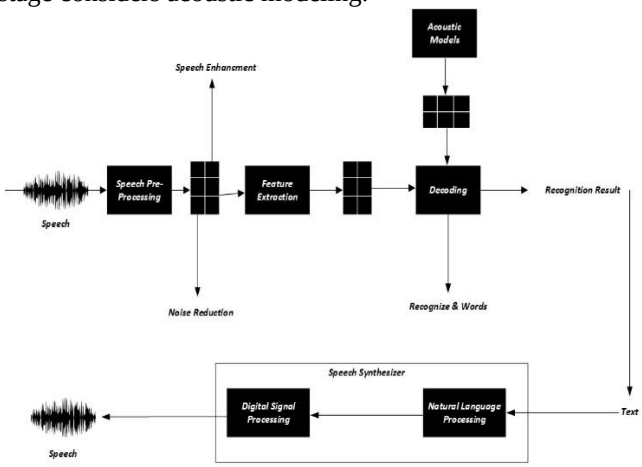

Figure 5: Methodology

A. Signal Processing

In Single Preprocessing, speech singles are separated. This means that Noisy Signal and useful signals are separate from speech and sent for feature extraction. As a human, we know what noise is but as a machine it's difficult to detect noise. Our speech recognition works on the energy threshold between 300-3500. The threshold below or above is considered as noise. There are many single preprocessing techniques used for speech or recognition performances and speech *enhancement* is one of the most important to enhance the signal and separate noisy signals. In the below equation *W* stands for a total number of speak words and *Ws* stands for Noisy words and *Wc* stands for useful words which need to be decoded.

$$Wc^{words} = W - Ws^{words}$$

B. Feature Extractions

Feature extraction aims to reduce data by discard unnecessary information *and* keeping the useful one.

After signal preprocessing, the task of the feature extraction is to discard the noisy signals and send the meaningful signals or information for decoding. As we use python speech recognition in our project, so the technique used for feature extraction is MFCC (Mel Frequency Cestrum Co-efficient).

C. Acoustics Model

An important part of ASR is the acoustic model, which constitutes most of the computational load and system performance. It is used to compare the compliance of the voice prompt with the expected voice of the hypothesis set. The acoustic model is designed to recognize spoken phonemes. Their creation involves using recordings of speech and its text and then compiling them into a statistical representation of sounds from words.

D. Decoding

Decoding is done with the use of the Acoustics model. After recognizing the spoken phonemes using a recording of speech and its text, decoding is completed and finally, speech is converted into text which in our case is the recognition result.

E. Natural Language Processing

Natural Language Processing understands the linguistics of the language being used (word pronunciation, accenting, phrasing) and performs logical interference on the text. The major operations of NLP are text analysis (dividing the text into words and sentences), pronunciation rules, prosody generation (phrasing and accentuation).

F. Digital Signal Processing

Digital Signal Processing is performed onto the processed text from NLP. Using many algorithms and transformations the text is finally converted into a speech format. The entire process involves speech synthesizing of speech. It's a complicated process but by using python and gTTS this process can be simplified to just a few lines of code.

V. EVALUATION

Test (customer side) evaluation we allow 10 different users to use our system and asked them to give feedback based on the questions present in table 1 and table 2. After collecting all the feedback from users we found that ***10 out of 10*** users say the system successfully allows the customer to register, login, compose mail & log out. ***8 out of 10*** users say the system successfully allows the users to view & delete mails. ***2 out of 10*** users say the system does not successfully allow the customer to view inbox. On the other hand, ***2 out of 10*** users find difficulty while deleting mails. ***7 out of 10*** users say the system allows the customer to read mails and ***3*** users found difficulties while reading mails. Overall feedback shows a lot of improvements in our system as compared to other existing systems but the feedback also shows that our system needs improvements in some of the modules which we planned to improve in future updates.

Table 1: Test (Customer Side)

Questions	Yes	No	Any Difficulty
Does the system allow the customer to Register?	10	0	0
Does the system allow the user to log in?	10	0	0
Does the system allow the customer to compose mail?	10	0	0
Does the system allow the user to view the inbox?	8	2	0
Does the system allow the customer to read emails?	7	0	3
Does the system allow the customer to delete emails?	8	0	2
Does the system allow the user to log out?	10	0	0

Test (admin side) evaluation we again allow 10 different users to use our system as an admin and asked them to give feedback based on the questions present in table 4. After collecting all the feedback from users we found that ***10 out of 10*** users say the system successfully allows the admin to login, add new users, delete users, modify users, view users. Feedback also shows that the system successfully allows the admin to add new admins, change user and admin status, reset the password, deactivate users and other admins & successfully allows admin to log out. Overall feedback shows that our system admin panel is one of the best panels present out there. The admin panel of our system is completely Django (a python framework used for web development) based which means it's completely secure, powerful, and user friendly. Due to these reasons, our system shows improvements as compared to other existing systems which don't have admin panels [28-34].

Table 3: Test (Admin Side)

Questions	Yes	No	Any difficulty
Does the system allow the admin to log in?	10	0	0
Does the system allow the admin to add new users?	10	0	0
Does the system allow the admin to view users?	10	0	0
Does the system allow the admin to delete users?	10	0	0
Does the system allow the admin to edit users?	10	0	0
Does the system allow the admin to add a new admin?	10	0	0
Does the system allow the admin to change user and admin status?	10	0	0
Does the system allow the admin to change or reset passwords?	10	0	0
Does the system allow the admin to deactivate users and other admins?	10	0	0
Does the system allow the admin to log out?	10	0	0

Testing of Voice-Based Email Web System proves that up to ***90%*** of functional requirements are fulfilled.

Some users also reported some difficulties in performing some functions. ***20%*** of customer says that reading mails from inbox some time take a long time and ***10%*** says it's good if attachments are included while reading emails from the inbox. ***90%*** of customers were satisfied with this system on the basis of functional requirements.

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Only ***10%*** of customers are not satisfied. Admin user doesn't face any difficulty as Django provide Build-in Admin Panel that's why almost ***100%*** were satisfied. In UI testing most of the users were satisfied. Because it's for Visually Impaired people ***90%*** say that UI is not a big deal at all but ***5%*** say it would be better if UI improved. The evaluation of Voice-Based Email Web System is conducted with the help of other existing systems which reveals that ***50%*** preferred our Voice Based Email Web System and ***50%*** preferred other existing systems. In evaluation we use comparative strategy, we used other existing systems to compare with Voice-Based Email Web System. For evaluation, we compare the customer interaction screens as well as the admin panel with other existing systems. After comparing we found that web pages need improvements in future work and also, we found that the Django admin panel is one of the best panels available now a day because it provides a lot of features and a user-friendly and responsive environment. We also compared our system security while storing passwords as compare to other existing systems and found that our system provides better security while storing passwords as compared to others.

Table 3: Test (Evaluation Result)

	Precision	Recall	Accuracy
User Evaluation	0.4	0.7	0.4
	0.3	0.4	0.5
Overall Accuracy = 0.5 → 50%			

VI. CONCLUSION

In this paper, we review all the existing voice-based email systems for blinds whether it's a desktop application, website, or an android application, and then we proposed our voice-based system. In almost every paper that includes desktop applications or websites, we found that tasks involve keyboard or mouse clicks, which makes it difficult for visually impaired people to use those systems efficiently. We also found that existing systems do not provide enough security. In most cases, passwords are stored in plain text or the existing systems use hashing algorithms like ***MD5*** and ***SHA*** but these hashing algorithms are not secure enough and can easily be decrypted. We must develop a system that is fully based on voice commands and eliminate the use of keyboard and mouse clicks & also provide better security. So we developed a voice-based email web system for visually impaired people which completely eliminates the use of keyboard or mouse clicks. The existing system cannot do this. The computer system guides the user to the operation he wants to perform. The main advantage of this system is that users don't have to worry about using the keyboard or mouse, because all operations are based on Interactive Voice Response (IVR). In the case of security our system use hashing which is the combination of the ***PBKDF2*** algorithm & ***SHA256*** hash. It's a one-way key for storing passwords & it's secure and required a massive amount of computing time to encrypt. Another most important part of our system is that it can be used by two people, whether it is an ordinary person or a disabled person. We developed a system in a way that if a normal user wants to use a system or to read a mail without voice commands our system allows them to choose between voice operation and normal operations. This will allow the normal user to use our system more efficiently and also the most important it saves time. The existing system cannot do this, so we are developing a new system, which will be of great help to the disabled and illiterate. It has also been seen that our system and all the existing systems have limited functionalities that can be improved with future improvements or updates like image or document attachment, forward mails, reply emails, search mails, etc. and we planned to improve our voice-based email system by adding all those functionalities for users in future updates so that they are able to use our system more efficiently and in a user-friendly way.

FUTURE DIRECTION

Email is considered to be the most ordinary form of communication through the internet. Research shows that there are ***4 billion*** global email accounts present in ***2020*** which makes ***52%*** of the world population and is increasing day by day [14]. However, it is difficult for visually impaired people to use this technology as it requires visual perception. Due to this reason, we developed a voice-based email system for visually impaired people. The system we develop shows improvements as compared to the existing desktop applications or websites. We completely eliminate the use of keywords and mouse clicks. On the other hand, our system uses the ***PBKDF2*** algorithm with ***SHA256*** hash which provides great security while storing the password and required a huge amount of time to decrypt as compared to other existing systems which stores passwords as plain text or use hashing algorithm like ***MD5*** and ***SHA*** which will be easily decoded. Also, we develop our system in a way that allows a normal user to choose between voice and normal commands to save time [15-27]. The existing system can't do that. For now, the system we developed is only suitable for computers. With the increasing use of mobile phones, this feature must also be activated as an application on the mobile phone. The main flaws of the system can also be used as future improvements. There are multiple flaws in this system i.e., image or document attachment, forward mails, reply emails, search mails. So, in future enhancement, we planned to improve our voice-based system and add all the required functionalities for users.

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