

IMPROVE NAVIGATION OF THE WEBMAIL INTERFACE USING ARABIC VOICE COMMANDS FOR ELDERLY AND DISABLED EMPLOYEES: A COMPUTER APPLICATION

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ABSTRACT

The development of humanitarian assistance applications has revolutionized business efficiency and daily convenience. Voice recognition technology (VRT), with its improved accuracy, has found extensive use in various fields, including assistance programs for individuals with disabilities or limited mobility in vehicles, homes, and websites. The authors have developed "Asis_Webmail," a computer application (PC-App) written in Python, to enhance the accessibility and usability of Webmail for Arabic-speaking seniors and physically disabled employees. The application allows users to navigate the webmail interface using Arabic Voice Commands (AVC), promoting independence and functionality in their daily lives. The effectiveness of "Asis_Webmail" was assessed through a survey of disabled employees, who reported finding the application useful and mentioning improved interaction with their email interface. Ultimately, this application aims to empower Arabic-speaking individuals, regardless of mobility disability levels, to independently use the Webmail interface using AVC, thereby promoting independence in both social and functional aspects of their lives.

KEYWORDS

Voice Recognition Technology, Webmail, Older Employees, Assist Applications, Arabic Voice Commands.

1. INTRODUCTION

The development of technology over the past few decades has brought about significant advancements in various aspects of daily and professional life. One such Invention in the history of communication is the emergence of E-mail, which has become an indispensable tool in personal, commercial, and functional contexts [29-40]. While the technology has undoubtedly provided several advantages to its users, it is important to acknowledge that not all individuals find it easy to access or use these technology tools. thus, disabled individuals (DIs) may face

challenges in fully utilizing technology due to physical or cognitive impairments. To ensure equal access to digital developments for DIs, it is crucial to focus on assistive technologies [8-10-36]. Individuals can conveniently create and access their Webmail accounts from anywhere online by utilizing the hosting website service and control panel (cPanel) [24]. Thus, the need for accessibility measures and benefits from technologies is particularly crucial for people with disabilities and older employees, who may find it difficult to keep up with technological advances. Although technological advancements like speech recognition and eye-tracking have made it possible for those with severe disabilities to interact actively with the world, there remains a need for accessible online systems that provide support and assistance [20-31-33]. Accordingly, investing in accessibility measures can significantly improve the quality of life for everyone, including disabled and elderly individuals. Through the use of assistive technology, employers can support these segments of the population in employment and reduce isolation and confinement to their homes [7-9-25]. Notably, it is vital to ensure that VRT is accessible and usable for handicapped individuals and older employees [42-45].

This paper explores the accessibility of cPanel's Webmail interfaces, specifically for DIs, the handicapped, and the elderly using VRT. It highlights the importance of incorporating this technology to improve accessibility and promote equal opportunities for all. This inclusive approach allows everyone to actively participate in society, regardless of their physical abilities or age.

1.1. Statistics

These statistics shed light on the prevalence of email usage, the preferences of job applicants, the exponential growth of the email and voice recognition markets, and the popularity of Python packages in the field of computer science, which was a strong motive for submitting this paper. Firstly, in Denmark, a staggering 93% of the population used email in 2016, indicating its widespread use and importance in communication. Furthermore, it is interesting to note that even individuals aged 65-74 had a high email usage rate of 98% [1]. Moving on to the Netherlands, 60% of respondents searching for work utilized vacancy websites, most individuals who changed employers relied on personal networks. These findings highlight the significance of personal connections in job transitions [34].

Next, into applicant preferences in the United States. In 2018, 76% of job applicants preferred to receive personalized email acknowledgement of their receipt [35]. This finding aligns with a survey conducted by The Balance Careers, indicating that 84% of respondents preferred receiving a personalized email acknowledging their application. These statistics emphasize the importance of personalized communication and the impact it can have on applicant satisfaction [37]. Shifting our attention to the sheer volume of emails sent globally, there is a study discovered that over 231 million emails were sent in just one minute in April 2022. Additionally, the daily email count in countries like the Netherlands, Japan, India, and Germany reached a staggering 8.3 billion. These numbers highlight the immense reliance on email as a primary mode of communication in today's digital age [13].

Furthermore, the growth of the voice recognition market, which is projected to increase from \$10 billion in 2020 to nearly \$50 billion in 2029, representing a compound annual growth rate (CAGR) of 23.7% [39]. This growth underscores the increasing importance and integration of VRT in various aspects of our lives. In the United States alone, there were approximately 142 million users of voice assistants in 2022, with predictions indicating a rise to 157.1 million users by 2026 [38].

Lastly, others examine the popularity of Python packages in the field of data science. Numpy and Pandas emerged as the most widely used Python frameworks, with respective market shares of

60% and 55% in 2021. These statistics highlight the dominance of Python packages in facilitating data analysis and manipulation [43].

2. LITERATURE REVIEWS

Advancements in VRT have transformed the way individuals interact with PC-App, particularly for handicapped individuals who face challenges in accessing and utilizing digital platforms.

2.1. About Voice Recognition Technology

The VRT, also known as Automatic Speech Recognition (ASR), revolutionizes the way users interact with modern systems by using spoken commands. By converting spoken human language into written text or translating it into specific actions. The ASR technology heavily relies on complex algorithms and machine learning (ML) methods to accurately decipher spoken words and interpret their intended meaning [11-30]. With its ability to understand and respond to human speech, VRT opens up a world of possibilities for hands-free communication in several industries [17].

2.2. Computer Applications using Voice Commands:

The use of voice commands in PC-App has gained popularity due to their convenience and accessibility. These applications provide hands-free interaction and simplify tasks for individuals with physical disabilities or impairments that limit their dexterity [12-17-23]. For instance, the voice access applications developed by Google enable users to navigate and operate smartphones using voice commands, which makes it easier for users to access functions like texting and making calls, as well as opening applications solely through voice instructions, promoting inclusivity and independence [21-44].

2.3. Assistive Technology for Handicapped Individuals:

The VRT has emerged as a powerful tool in the field of assistive technology, catering to the diverse needs of individuals with visual impairment or mobility impairments. By employing voice commands [23-28], individuals can control electronic devices, access information, communicate, and perform other tasks that might otherwise be challenging or impossible. This technology enables DIs to overcome barriers and participate fully in educational, professional, and social contexts [4-18-22].

2.4. Google Voice Recognition:

Google voice recognition is one of the most widely used speech recognition systems, offering accurate and versatile voice input capabilities [41]. This technology allows users to dictate text, control applications, and perform various tasks using spoken commands. It is accessible across multiple platforms, including smartphones and tablets. aside from supporting numerous languages, including English, Spanish, French, and German [21]. Google Voice Recognition has been integrated into various assistive technologies, empowering DIs to access information, communicate, and interact with digital systems effectively [3-32].

2.5. Arabic Voice Commands:

Developing accurate and efficient Arabic speech recognition systems poses unique challenges due to the complex phonetic structure and grammar of the Arabic language. and employed

various techniques to address these challenges and enhance Arabic speech recognition capabilities [5]. For instance, there is an Arabic speech recognition system that combines deep learning models with traditional acoustic models, achieving promising results in accurately transcribing Arabic speech [2-6]. AVC have been integrated by app and assistive technology developers, enabling users to control wheelchairs and access computers using only their voice. This advancement enhances accessibility for Arabic-speaking individuals, empowering them to perform tasks independently [26].

3. SYSTEM DIAGRAM

The application is an innovative solution that allows users to access their Webmail accounts directly through their browser using VRT. To develop this application, Python's voice libraries were utilized along with the recognize speech feature in Google. These technologies work together to allow the program to recognize voice commands given through a microphone. Then the Python audio libraries convert the voice into keyboard event inputs via the (Keys_Event) function and hyperlinks, which can interact with the Webmail interface on the browser as shown in Figure 1 for the block diagram of the developed system as well as Figures 2 and 3 show a simple part of the Python code. One of the most important goals of the developed PC-App is to create a comfortable experience that makes it easier for anyone to use it. Therefore, Graphic User Interfaces (GUI) are integrated into the application through the executed voice commands that are displayed visually, making it easier for users to manipulate their Webmail accounts and navigate them. This visual representation greatly improves the overall usability and ease of interaction with the developed application, as shown in Figure 4.

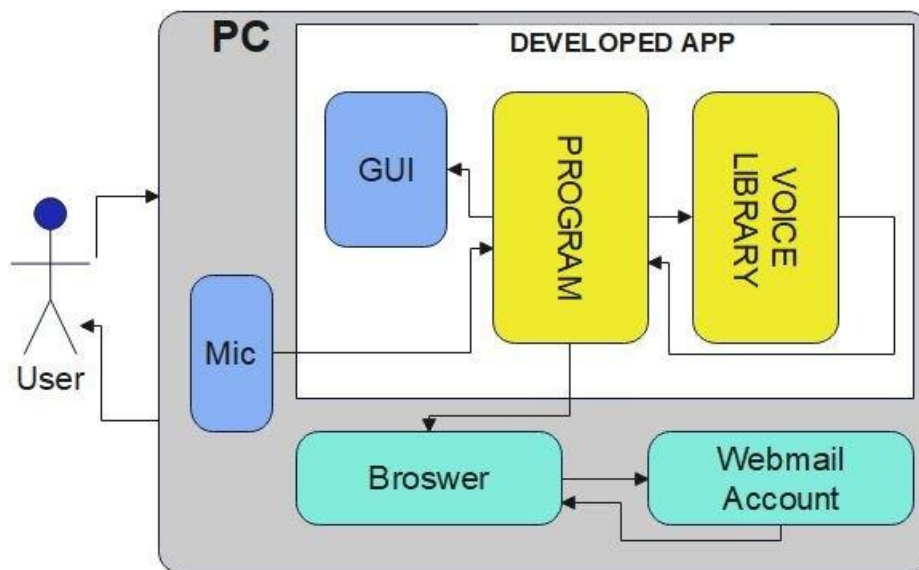
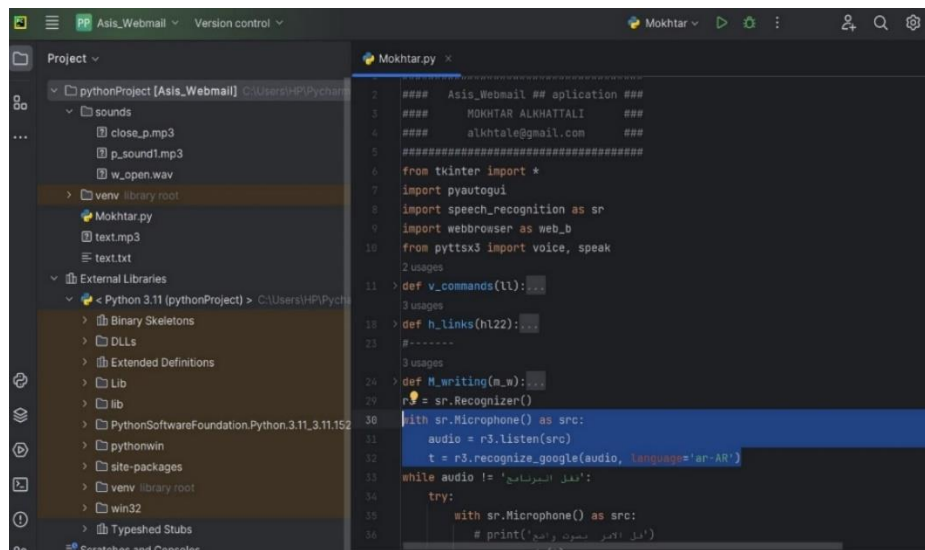


Figure 1. Diagram of the developed system

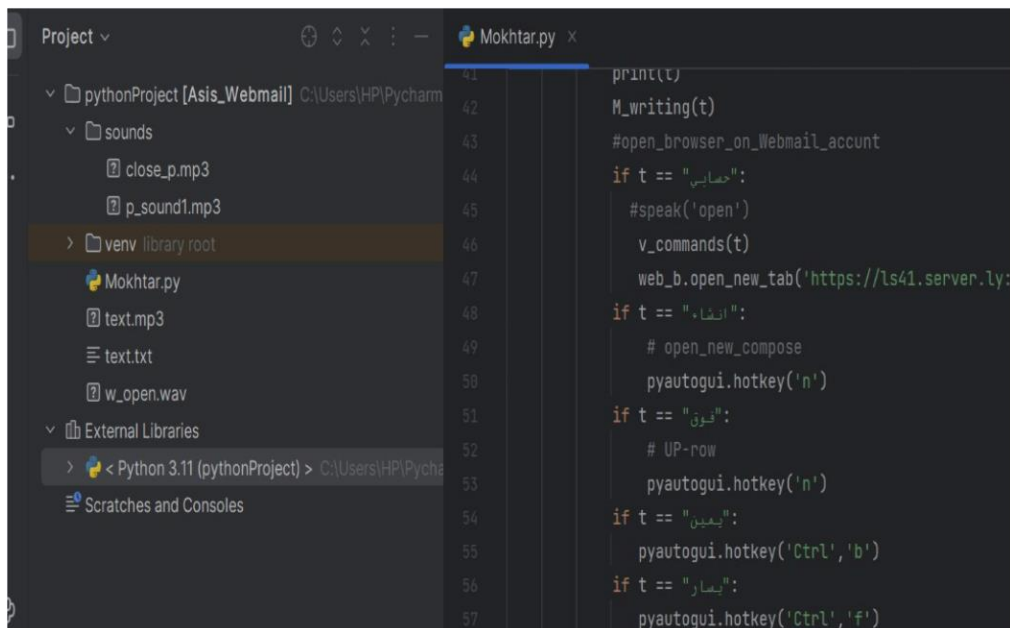


```

1 ##### Asis_Webmail ## application #####
2 ##### MOKHTAR ALKHATTALI #####
3 ##### alkhatale@gmail.com #####
4 #####
5 #####
6 from tkinter import *
7 import pyautogui
8 import speech_recognition as sr
9 import webbrowser as web_b
10 from pytsx3 import voice, speak
11 2 usages
12 > def v_commands(t1):
13 3 usages
14 18 > def h_links(hl22):
15 #-----
16 3 usages
17 24 > def M_writing(m_w):
18 r = sr.Recognizer()
19 with sr.Microphone() as src:
20 audio = r3.listen(src)
21 t = r3.recognize_google(audio, language='ar-AR')
22 while audio != 'قفل البرنامج':
23 try:
24 with sr.Microphone() as src:
25 # print('تمت الصوت واضح')

```

Figure 2. Python code in the developed application



```

41 print(t)
42 M_writing(t)
43 #open_browser_on_Webmail_accunt
44 if t == "حسابي":
45 #speak('open')
46 v_commands(t)
47 web_b.open_new_tab('https://ls41.server.ly:
48 if t == "انفا.":
49 # open_new_compose
50 pyautogui.hotkey('n')
51 if t == "فوق":
52 # UP-row
53 pyautogui.hotkey('n')
54 if t == "يعين":
55 pyautogui.hotkey('Ctrl','b')
56 if t == "يمار":
57 pyautogui.hotkey('Ctrl','f')

```

Figure 3. Python code in the developed application

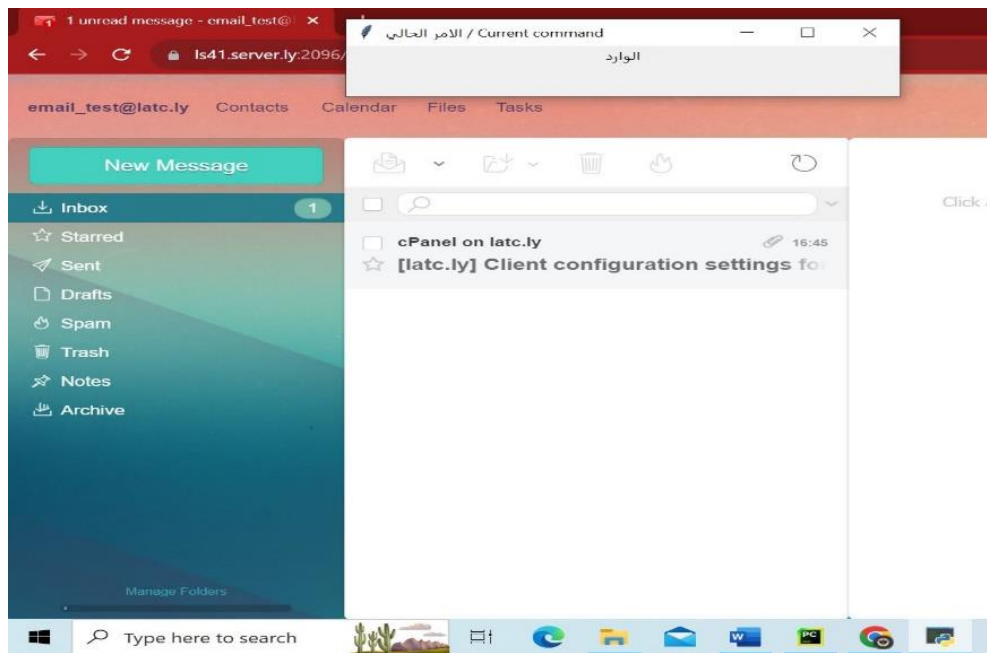


Figure 4. Popup frame for displaying the current voice command

4. REQUIREMENTS OF DEVELOPED SYSTEM

It is necessary to fulfill certain requirements set during the development of any system in order to function properly. The Asis_Webmail application requires both hardware and software components that facilitate the smooth development and implementation of the application. Specifically, a computer system capable of running Windows 10 was needed, along with a microphone for audio input, whether it was built into the computer or an external one. During the development phase, open-source software was favoured to minimize costs. As a result, the project incorporated numerous programs and libraries that are essential to its functioning. These include:

- **Python 3.12:** This particular version of the Python language was utilized for developing the application. Python is renowned for its simplicity in coding, versatility, and supportive community, making it an excellent choice for this project [27].
- **Tkinter library:** It serves as the standard GUI library in Python. It empowers developers to create visually appealing and user-friendly interfaces for their applications.
- **Recognize_Google library:** This specific library is designed for programming speech recognition applications using Google's services. It aids in converting audio input from a microphone into text by leveraging Google's speech recognition capabilities. Additionally, it supports multiple languages.
- **Pyautogui library:** utilized to implement keyboard events and manage mouse cursor events on the desktop. this advantage allows for the control of any key as needed programmatically.

5. KEY EVENTS FLOW CHART

The Python language has a variety of libraries that can be used to manipulate the keyboard and a mouse on the desktop [15-16]. Through the integration of voice commands with libraries and functions into the system, users were able to execute desired actions on Webmail. The concept behind this integration is depicted in Figure 5. Combining software commands with voice commands enabled seamless execution of key events. Users could simply speak their desired action, and the system would carry it out accordingly.

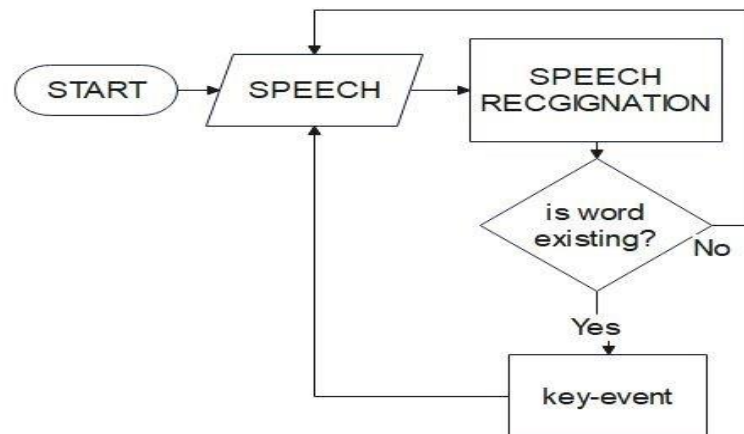


Figure 5. Flowchart of speech commands

6. LAUNCHING A COMPUTER AND AN APPLICATION

6.1. Turn the Computer on/off

To cater to disabled and elderly individuals, implementing methods like motion sensors and push buttons on PCs can be operationally effective solutions. Which can be set up on the PC based on the specific disability and user requirements.

- **Firstly**, the push button should be designed to be of medium size so that it can easily be operated with either the leg or head. It is strategically mounted in a convenient location for the user and connected to the PC as a substitute for the regular operating button. Thus, it allows individuals with limited mobility to turn their PCs OFF/ON.
- **Secondly**, a motion sensor can be employed as an alternative control method. It is installed in an appropriate place within proximity to the user but away from constant movement that could cause false triggers. The electronic circuit of the motion sensor is prepared, and its power supply is derived from the computer itself. In most cases Passive InfraRed (PIR) sensor is used as a switch on/off [19], enabling users to interact with the computer through simple body movements or gestures.

6.2 Run the application

The application is installed on a PC following the provided installation instructions. Once installed, is added to the list of programs that automatically run when Windows boots up. This

ensures that the application starts up automatically and is ready to receive voice commands through the microphone. The first command to activate Webmail in the browser is "HESABBI". And if there are any unknown voice commands, the application does not respond to them. Additionally, there are alert pop-up messages to guide users and give them an opportunity to repeat their commands if they are unclear.

The program immediately recognizes specific command words such as "ERSAL", "ENSHA", "FAWQ", "ALTALE", "KHALEF", and "KAFEL." It accurately identifies these words and takes appropriate action accordingly. Table No. 1 displays a portion of the speech commands, corresponding reactions, and hyperlinks used within the program. It should be noted that when writing a lengthy message in Arabic, the command word "KETABA" is used. On the other hand, the command word "ENGLISH" is used to switch to receiving speech English for writing letters and numbers or writing long messages solely in English. The command word "Arabic language" can be used to go back to receiving AVC.

TABLE 1. Some Of The Arabic Voice Commands With Its Reaction

Commands voice in Arabic	Reaction of Key event
(حسابي HESABBI)	To open the browser on the Webmail account
(إنشاء ENSHA)	To open compose in Webmail
(قفل KAFEL)	To close the currently active window
(تحت TAHET)	As if you were pressing the Down arrow key
(التالي ALTALE)	As if you were pressing the Tab key
(خلف KHALEF)	As if you were pressing the Backspace key

Using this method, you can type the recipient's name, email address, subject, or any sentence using the appropriate sound.

7. EXPERIMENTS AND RESULTS

A small group of physically disabled employees of various ages were taught how to send and receive emails using a system. They were interviewed after 7 days to learn more about their experience. A majority of participants rated the application as good, with more than 82% commenting positively. Some elderly participants had difficulty writing emails since they needed more practice. Figures 6 and 7 show the results.

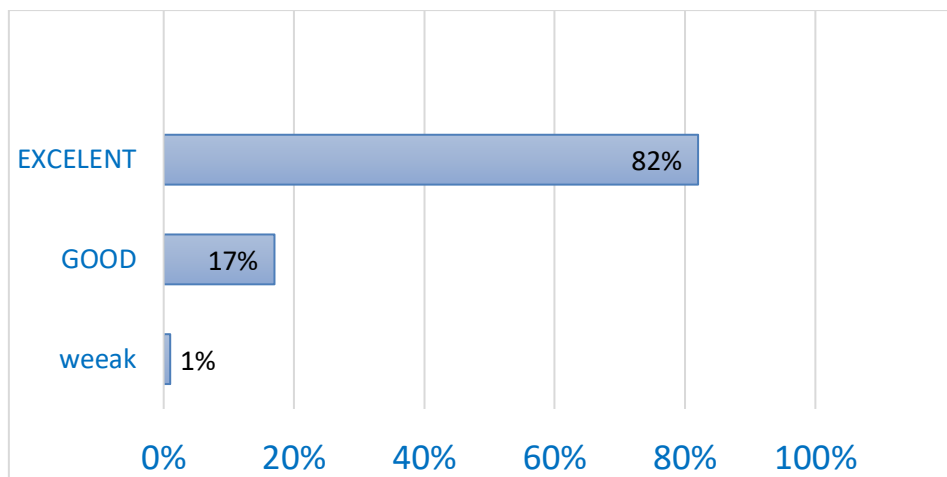


Figure 6. Evaluate the developed system

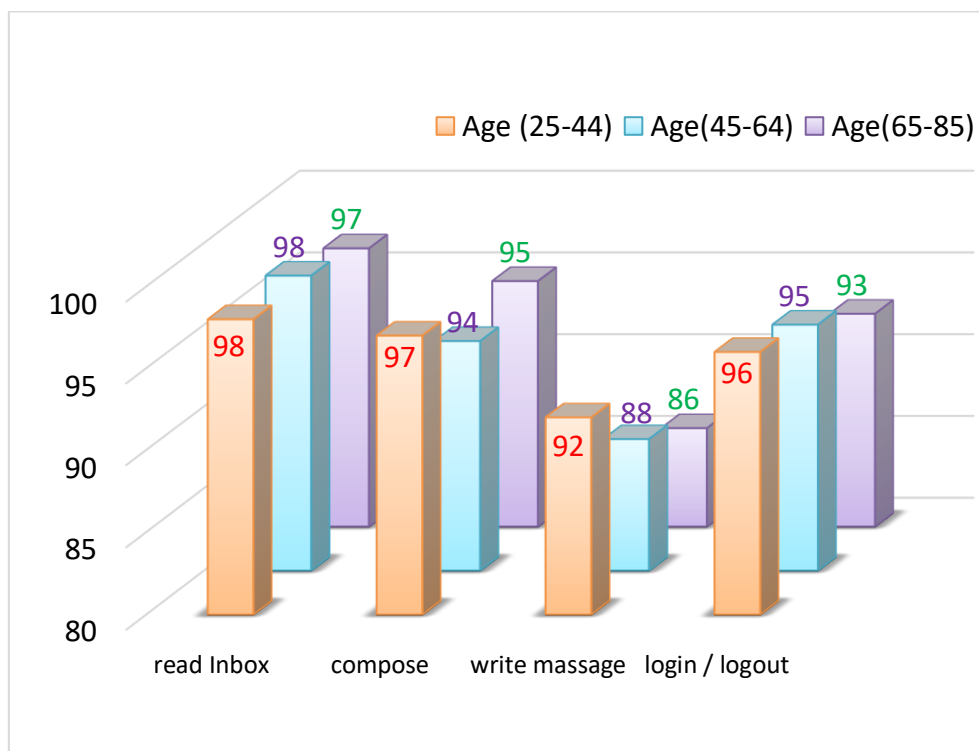


Figure 7. Evaluate the uses of the developed system according to age.

8. LIMITATIONS OF THE SYSTEM

The study focused on designing a system for Arabic-speaking individuals, particularly those with physical disabilities affecting their hand usage and can movement of specific body parts. It assumes that these individuals have the ability to speak comfortably, as the system relies on voice recognition. From a technical perspective, the application is dependent on a reliable Internet connection for email browsing and voice recognition functions. The system also requires a relatively quiet environment, such as private rooms or offices, in order to achieve optimal performance.

9. CONCLUSION

The creation of a specialized application aims to aid Arabic speakers with disabilities or old age in using their Webmail accounts more easily. Traditional input methods like keyboards or mice can be challenging for them; hence, this application provides a solution. By utilizing VRT, the application allows users to access all the features of their Webmail platform effortlessly. In addition, Arabic speakers can log in and out, navigate through various pages of their Webmail account, and even power their PCs on and off. Not only is this system cost-effective, but it is also simple to set up and operate. Ultimately, the system significantly enhances the quality of life and simplifies work for handicapped employees who struggle with conventional input methods.

10. SUGGESTIONS FOR DEVELOPMENT

The system has already shown promising results, but there is still potential for further improvement. The system has the ability to expand to include compatibility with other communication platforms like Gmail, WhatsApp, Facebook, and Outlook within the same application. By integrating artificial intelligence, the system could learn multiple languages as voice commands directly from users, granting them the flexibility to choose their preferred language. Additionally, developing the system to be compatible with other operating systems makes it accessible to a wider user base.

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