Virtual Personal Assistant For The Blind

RutujaKukade,RuchitaFengse,KiranRodge, Siddhi Ransing, Vina M. Lomte

Student,Student,Student,Student,Head of Department

Computer Department,
RMD Sinhgad School Of Engineering, Pune,India

*Abstract :*There are various communication barriers for people who are blind or deaf, also they have to deal with various challenges. In this paper, we have described the implementation of a personal virtual assistant which can take the human voice commands to perform tasks which otherwise would need the dependence on others. It enables user to receive and send emails, know the weather forecast report, detect the fire and the smoke in the room, recognize face to unlock the door etc, using Speech to Text Engine, Text to speech Engine, OpenCV (LBPH algorithm) using microphone for the input and speakers for the output.

IndexTerms - **STT,TTS,virtual assistant ,raspberry pi, speech recognition.**

I. INTRODUCTION

In 2016, M. Ramlrez made an attempt to make an automatic speech recognition(ASR) system to help preschool children to learn Braille, but it is difficult to interpret and it is quite expensive[2]. In 2015, A. Mishra developed a voice-controlled personal assistant robot ,in this voice commands are given to the robot remotely, using smart mobile phone in this approach there was a power wastage as well as there was a huge requirement of hardware[3].In 2018, SudhaNarang made comparison between various face recognition algorithms namely FisherFace, EigenFace, LBPH and concluded that LBPH is most efficient amongst all algorithms[10].

Now, using IOT (IOT refers to the idea of enabling everyday objects to communicate over a network without requiring person-to-person interaction) and Artificial Intelligence(AI is the art of creating machines that perform functions that requires intelligence) we can build a virtual personal assistant for blind which will not be difficult to operate. Basically, virtual assistant is the Intelligent

Personal mini-computer of user that are useful for helping the users to automate tasks and accomplish tasks with minimum human interaction with a machine. The interaction that takes place between a user and a virtual assistant seems natural ,the user communicates using their voice, and the virtual assistant responds in the same way.

The virtual personal assistant can:

1. Weather forecast

2. Fire Detection

3. Gas leakage detection

4. Switch On or Off appliances

5. Face Recognition.

Using the modules like Speech to Text Engine, Text to speech Engine, OpenCV(LBPH algorithm).

II. Literature Survey:

"An automatic speech recognition system for helping visually impaired children to learn Braille [2]"

Advantage: By using automatic speech recognition with hardware module it detects the vowels pronounced by the user corresponding with the command and it helps preschool children to learn Braille system.

Disadvantage: This system is very complex and applicable for limited number of subjects.

" AVoice controlled personal assistant robot [3]"

Advantage: By using this system, the personal assistant robot performs different movements through the human voice commands given to the robot assistant by using smart phone.
Disadvantage: In this system, voice commands are operated using cloud server which makes the system costly.

"Virtual personal assistance [9]"

Advantage: By using this system, we can give the Artificial Intelligence more control on the hardware so that virtual personal assistant can perform lots of different operations.

Disadvantage: In this system as hardware failure may happen it will not cost effective.

" VPA : Virtual Personal Assistant[4]"
Advantage: This system reduces the use of input devices like keyboard and/or mouse and provides remote access to the system and also the addition of new commands to the system for performing various tasks that will facilitate the disabled people.
Disadvantage: In this system the input is given through LAN or Wi-Fi for that it will require its own local Apache web server.

"Voice Recognition and Voice Navigation for Blind using GPS [7]"

Advantage: In this system voice recognition module is interfaced with the Arduino and also this system is cost effective.
Disadvantage: This system does not provide any internet access functionality for blinds.

III. System Architecture:

The various modules of the project are-

A. Speech recognition

This module is combination of TTS and STT modules. Basically Speech recognition system consist of TTS(Text To Speech) module,logic processor and STT (Speech To Text) module. SpeechRecognition library supports Google Speech Recognition. In this module first user's voice is stored in .wav file as input which is sent to Google's SpeechRecognitionengine.Thisprocessing is performed in TTS engine. Output of this will be text string which is passed as input to TTS module. TTS module converts text string into voice.

B. Speech to Text and Text To Speech

In this module voice commands are captured with the help of voice hat and microphone. These voice commands are then send to google voice API. Google voice API compares voice commands with stored commands in command configuration file. With the help of central processor processing is done and the result is sent to Google speech API for text to speech conversion.

C. Weather Forecast

Weather information is obtained from the weather.com web site with the help of a Python module name pywapi. It requires city name and city code for weather report generation. User can access following weather information :
- Temperature
- Wind
- Humidity
- Pressure

D. Fire Detection

In this module, possibility of fire is detected in the room using parameters like humidity and temperature with the help of sensor. If the temperature is above threshold i.e. if it is high and humidity is low then fire will be detected and an alert message will be sent through an email to the relative of the blind.

E. Gas leakage detection

In this module, leakage of gas can be detected with the help of MQ6 sensor. In the case gas is detected, a notification is sent to the registered email address raising an alert.

F. Switch On or Off appliances

The assistant system can control the homeappliances (the working for electric bulb is implemented) through the GPIO pins of the raspberry pi. When the user commands the system to switch on the light, the bulb glows and when the user commands the system to switch off the light, the bulb goes off.

G. Face Recognition
The system provides security for the blind person by notifying about the person at the door. Some faces are stored and the system is trained to recognize these specific faces. The system using LBPH algorithm to recognize the face with high confidence. If the face is recognized, the door will be opened and the blind will be notified of the same. On the other hand, if the if an unknown face is encountered, the door remains closed and a notification is sent to an intented person through mail.
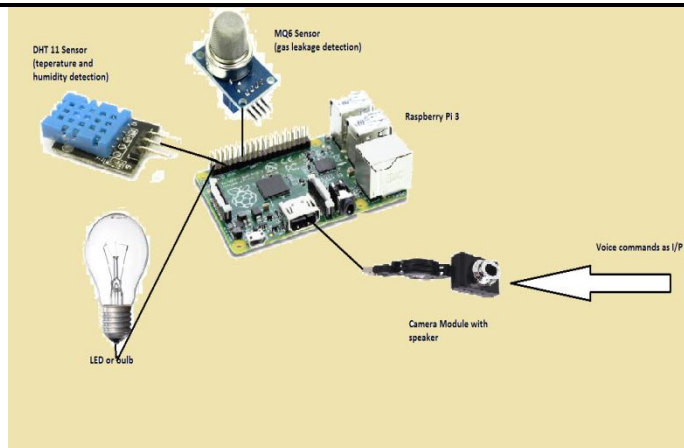
Fig. architecture design

IV. Proposed Work:

The Raspberry pi is mounted with a camera , sensors and a speaker and a dual microphone is connected to it.

The voice is recognized by the Speech Recognition package of Python which uses Google Web Speech API.

The commands are interpreted using the Recognizer and the appropriate task is carried out.

The temperature and the humidity is measured with help of various sensors which are connected to the Raspberry pi and accordingly the fire and smoke will be detected.

With the help of camera the face of the person can be recognized who is at the door using LBPH algorithm and it unlocks the door for known face and if the face is unknown then an alert message will be sent through an email .

V. Mathmatical Model:

LBPH algorithm uses divide and conquer strategy to recogniize the face as:

$$LBP(x_c,y_c)=\sum_{p=0}^{p-1} 2^p s(i_p-i_c)$$

with (x_c,y_c) as central pixel with intensity and being the intensity of the neighbour pixel s is the sign function defined as:

$$s(x)=\begin{cases} 1 & \text{if } x\geq0 \\ 0 & \text{else} \end{cases}$$

For a given Point (x_c,y_c) the position of the neighbour (x_p,y_p) can be calculated by

$x_p=x_c+Rcos(2\pi p/p)$

$y_p=y_c-Rsin(2\pi p/p)$

Where R is the radius of the circle and P is the number of sample points.

$f(x,y)\approx[1-x \quad x] \quad f(0,0) \quad f(0,1) \quad 1-y$

$f(1,0) \quad f(1,1) \quad y$

VI. Result:

Modules	Existing System	Proposed System
Speech recognition	Yes	Yes
Weather forecast	Yes	Yes
Fire Detection	No	Yes
Gas leakage detection	No	Yes
Switch On or Off appliances	Yes	Yes

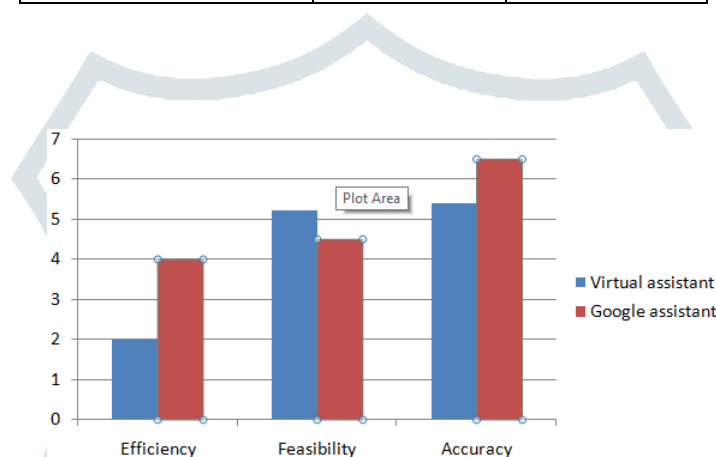Fig.statistical analysis

VII. Conclusion:

In this paper, we have discussed about a voice guided virtual personal assistant to access the internet in order to get news feed, weather forecast, detect the fire and smoke in the room and also to recognize the face to unlock the door. The system uses a Raspberry pi with microphone to process the commands and talk back to the user with the help of speakers, sensors to detect the fire and smoke in the room and camera to capture the face to be recognized.

VIII. Future Scope:

In future work, the above system can be integrated with many devices like AC, fans, refrigerator, etc to build complete home automation system for the blind. The system can also be enabled to access the internet, read and write emails, gather information from wikipedia, ring the phone to locate it, set reminders or notifications etc.

IX. References

[1] Prince Bose, ApurvaMalpthak, UtkarshBansal, AshishHarsola Fr. Conceicao Rodrigues Institute of Technology, "Digital Assistant For The Blind", 2017 2nd International Conference for Convergence in Technology (I2CT)

[2] Melissa Ram´ırez, Miguel Sotaquir´a, Alberto De La Cruz, Esther Mar´ıa, Gustavo Avellaneda, and Ana Ochoa, "An Automatic Speech Recognition System for Helping Visually Impaired Children to Learn Braille", 2016 IEEE

[3] Anurag Mishra, PoojaMakula, Akshay Kumar, Krit Karan and V. K. Mittal, "A Voice-Controlled Personal Assistant Robot", 2015 International Conference on Industrial Instrumentation and Control (ICIC) College of Engineering Pune, India. May 28-30, 2015

[4] SumitkumarSarda, Yash Shah, Monika Das, Nikita Saibewar, ShivprasadPatil , "VPA: Virtual Personal Assistant", International Journal of Computer Applications (0975 – 8887) Volume 165 – No 1, May 2017

[5] Andrew Ennis1, Joseph Rafferty, Jonathan Synnott, Ian Cleland, Chris Nugent, Andrea Selby, Sharon McIlroy, Ambre Berthelot, and Giovanni Masci, "A Smart Cabinet and Voice Assistant to Support Independence in Older Adults", Springer International Publishing AG 2017.

[6] ManishaBansode, ShivaniJadhav, Anjali Kashyap, "Voice Recognition and Voice Navigation for Blind using GPS" , INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING   Vol. 3, Issue 4, April 2015.

[7] K. V. SaiVineeth, B. Vamshi and V. K. Mittal, "Wireless Voice-Controlled Multi-Functional Secure eHome", 2017 IEEE.

[8] Chen-Yen Peng and Rung-Chin Chen, "Voice Recognition by Google Home and Raspberry Pi for Smart Socket Control", 2018 Tenth International Conference on Advanced Computational Intelligence (ICACI) March 29–31, 2018, Xiamen, China.

[9] Aditya K, Biswadeep G, Kedar S and S Sundar, "Virtual personal assistance", IOP Conf. Series: Materials Science and Engineering 263 (2017) 052022.

[10] SudhaNarang,KritiJain,MeghaSaxena, AashnaArora, "Comparison of Face Recognition Algorithms using OpenCV", International Journal of Scientific and Research Publications, Volume 8, Issue 2, February 2018.