Design and Development of a Compact Communication System for Deaf, Dumb and Blind People

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Abstract: Communication is an integral part of our lives as it a mode of sharing and discussing our ideas and thoughts for the betterment of mankind. Unfortunately, some disabled people cannot talk (dumb), see (blind), and hear (deaf); hence facing difficulty in day-to-day chores. It has become a major issue as the World Health Organization states that as many as 28.5 crore persons are blind, 46.6 crore persons are deaf, and 10 lakh persons are vocally impaired, worldwide. This paper proposes a compact communication system that aids the blind, dumb, and deaf people for the purpose of easy communication. Science and technology have rapidly developed making everyday tasks simpler and easier but there still exist some underprivileged people who face difficulty in something as basic and essential as communication. This project focuses on overcoming the gap in communication between the disabled and normal people. Although there already exists devices to help people who are blind, deaf, and dumb individually; to address all the issues within a single compact system is challenging. The final result of this project is a system that provides aid to all the above-mentioned disabilities, in a single compact system. The four objectives of the project are as follows; Text to Speech and Image to Speech for visually impaired people. Speech to Text for deaf people. Gesture to Text for dumb people. The Text to Speech is converted using gTTS API and Play Sound module. Similarly, Speech to Text is converted using URL Speechtexter.com. Image to Speech is converted using the Open-CV and Tesseract OCR software. Gesture to Text is converted using the Open-CV software and Gaussian Algorithm. The design part of our project includes a Raspberry Pi board, Webcam, Speaker, Keyboard, Screen, and Microphone. Raspberry Pi board is a tiny computer that can be connected to a computer screen or television while using keyboard and mouse as input devices. The keyboard is used to provide the input text. Webcam is 25 MP, used for capturing images. It also has an inbuilt sensitive Microphone that is used to record the voice. Speaker is used as an output module to hear the speech that is converted from text and image. For Speech to Text and Gesture to Text, the output text is observed on the screen.

Keywords: Raspberry Pi 2 board, Webcam, Speaker, Keyboard, Display Screen and Microphone.

1.0 Introduction

In daily life, communication has become a major concern for the deaf, dumb, and blind people. The World Health Organization states that as many as 28.5 crore persons are blind, 46.6 crore persons are deaf, and 10 lakh persons are vocally impaired, worldwide. India is a densely populated country. The numbers of blind, deaf, and dumb people are high as 70 million [1]. Majority of the blind, about 82%, are the older generation people.

India is said to have the most count of visually impaired people across the world. In this world, about 3.7 crore individuals are visually impaired and approximately half of them belong to India. In order to help these persons, this projects develops a compact communication system for the blind, deaf, and dumb people [2]. The development of our project helps the multitude to experience independence. Many people suffer from one or more conditions mentioned above. A person could be disabled (blind, deaf, dumb) by birth or due to an accident later on in life. Either way it is an unavoidable and critical issue. It suppresses the affected person's confidence and growth as they are not able to perform everyday simple tasks due to the complications while communicating. Sign language is used as a medium of communication by the disable people (deaf and dumb) to interact with the normal people and as well as people of their own kind.

Sign language depends mainly upon the body language of an individual. A language that makes use of hand gestures and expressions on face, are most commonly used by the people who are deaf and dumb. British and American sign languages are two kinds of sing languages. The people suffering from hearing losses and vocal impairment use sign language while communicating, unfortunately, most of the normal people are unfamiliar with it. The masses aren't familiar with the sign language. Hence, creating a communication gap between the deaf and mute and the normal people. Braille is language employed by the blind people, which includes reading and writing by feeling a set of dots that denote different alphabets. The dots may represent various numbers and punctuations as well. Braille is understood by moving fingers left to right, line by line.

Blind people most commonly use Braille language for communication but it is not understood by the masses. This could result in a complex situation, making it necessary to develop a prototype to overcome the communication gap between the deaf, dumb, and blind and the normal people. This project concentrates on building a system to help the blind, deaf and dumb people in communication. It will allow them to freely express their ideas and thoughts hence making them independent. Now, with the help of this system they can communicate with the people of their own kind and as well as the normal people. As it is a single compact system, it is useful for a person who is suffering from one or more disorders, like deaf, dumb, and blind.

The main objectives of the project are to convert Text to Speech, Image to Speech, Speech to Text, and Gesture to Text. Text to Speech is used for the blind people. Image to Speech is also used for the blind people. Speech to Text is used for deaf people. Gesture to text is for dumb people. The Text to Speech conversion is done with the help gTTS API and Play Sound module. The gTTs is a Google Text to Speech module useful in the conversion of a given text into speech. It can recognize texts in different languages. The corresponding speech is heard using the Play Sound module. Similarly, speech to text conversion is done using URL Speechtexter.com. It is a software that is useful in recording the voice using a microphone and converting it into the corresponding text. A screen is used for the display of text. Image to Speech conversion is done using Open-CV and Tesseract OCR software. Open-CV is used for capturing the image using a webcam. The following image is converted into text first with the Tesseract OCR software. Then, text is converted into speech and can be heard using the Play Sound module. The Gesture to Text conversion is done using Open-CV software and the Gaussian algorithm. The Open-CV software is used to capture the image of the gesture and the Gaussian algorithm converts image into text.

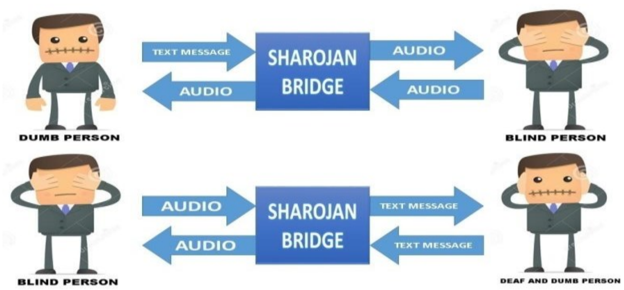


Fig-1 Sample Picture for Compact Communication System

2.0 LITERATURE REVIEW

Science and technology have advanced in the last few decades, leading to the development and designing of various communication systems for the blind, deaf, and dumb.

Amit Gupta, Likitha B S and Venkatrao P (2018) [4] proposed a communicator for the blind, deaf and dumb, as communication is big concern for such people. It is necessary as a deaf or dumb person may communicate using sign language but it is not understood by a normal person. Similarly, the blind person may face similar complexity while communicating with a normal person. He suggested the system would use the sensor glove to recognize the hand gestures by the unhearing and mute people. The blind people would use the Braille keypad to give an input text. Speech to Text conversion would be done using the mobile app, for the blind and deaf people. The inputs are processed using the IoT concept. The data is transmitted to produce the corresponding three outputs; on the LCD screen (for text), speaker (for speech), and six motors (so as to represent a braille character). Hence, allowing the user to communicate with people across the world without the use of the internet. Although using this concept, the system manufactured is compatible and has high usability, it can be expensive.

B. Rajapandian, Harini V and Raksha D (2017) [5] says, communication is the only efficient way to express our thoughts and ideas while a disabled person; blind, deaf, and mute, conveying is a major issue. The lack of communication often leads them to social isolation. Hence, he proposed a novel system that suggests to use Portable Technology and the Arduino Board to overcome the communication gap between the differently-abled and normal people. This system allows the users to communicate and transfer messages as per their requirements and abilities. The system has a drawback as it uses Arduino board which cannot be used for long-distance communication. In future this issue could be avoided with the development of the use of internet features to make the connectivity of devices better.

Mariam Moustafa Reda, Rania Ahmed Abdel and Azeem Abul Seoud (2018) [6] proposed a novel sign-voice bidirectional communication system for normal and disable people based on machine learning. The system suggested to design a human-computer interface to facilitate the communication between the above-mentioned people. Sign-voice bidirectional communication will help the blind and deaf/dumb person to communicate. The blind person will be able to hear the word representing the gesture by the unhearing/mute person. Similarly, the unhearing/mute person will get the sign corresponding to the phrase spoke by the visually impaired person. SVBiComm works in bi-direction, the first step is conversion of video to speech. The signs are converted into text. Then, TTS API produces the corresponding audio. The last or second step is to process speech to video. Then, STT API converts the voice from person into text. Using SVBicomm has advantages like it can examine the composite background and also capture from a long extent. The proposed system faces some difficulties; such as gesture limitations. It also requires a noiseless surrounding.

V.Padmanabhan, and M.Sornalatha (2019) [7] proposed a new system called "Hand Gesture Recognition and Voice Conversion System for Dump People". He says since normal people aren't familiar with the hand sign language, during emergencies conveying their message is a difficult task. Hence, he suggested providing a solution to this problem, i.e. converting gestures into speech. Two important techniques are present to inspect gestures such as vision and non-vision techniques. Then, converting the information found into voice using the Raspberry Pi board. A camera is made use of for the vision-based technique. While, sensors are made use of for the non-vision-based technique. In the project he suggested the use of a non-vision-based technique. The normal people's voice is transformed into gestures. In case of crisis the text will be sent to the family. The major advantage of this system is that it is light weighted and compatible, it can be carried around very easily. It requires simple coding. It has certain drawbacks because it is not accurate. Also, an external ADC has to be used since raspberry pi does not have an ADC naturally.

3.0 METHODOLOGY

The methodology to achieve the objectives of this project is obtained by the block diagram as shown in the figure.

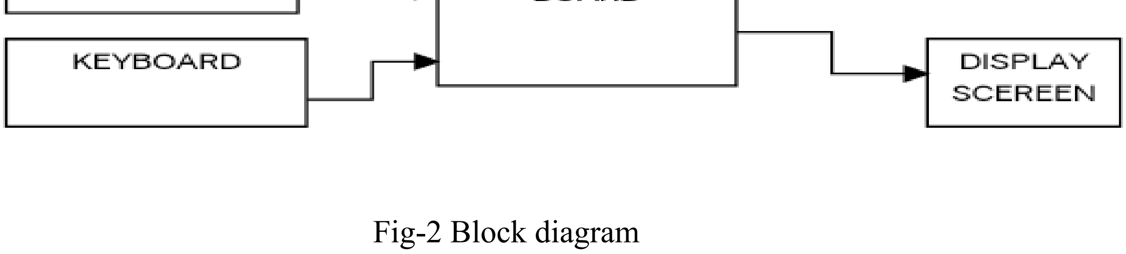


Fig-2 Block diagram

Fig 2 Depicts: Raspberry Pi board. An external SD card installed with the Raspbian OS software is used. A 25MP webcam and keyboard are used as input components. A speaker and display screen are used as output components.

3.1 EXPERIMENTAL WORK

The hardware of the project is as shown in the figure below. In this project, we have used a Raspberry Pi 2 board. It uses an external SD card installed with Raspbian OS software. An ethernet cable is used to enable internet facility to the board. A supply of 5V is also provided.

A Keyboard and Webcam are used as the sources of input. The Keyboard is used to enter the text in case of "Text to Speech" conversion. The 25 MP Webcam is used as a microphone to record the speech in case of "Speech to Text" conversion and a camera to capture image in case of "Image to Speech" conversion. The Webcam is also useful in case of "Gesture to Text" conversion. Both keyboard and Webcam are connected to two different USB Ports of the Raspberry Pi 2 board.

A Display Screen and Speakers are used as the sources of the output. The output of "Text to Speech" and "Gesture to Text" are presented on the display screen. "Speech to Text" output and "Image to Speech" are heard on the speakers. The speaker is connected to the Audio and Composite Jack Port of the Raspberry Pi 2 board.

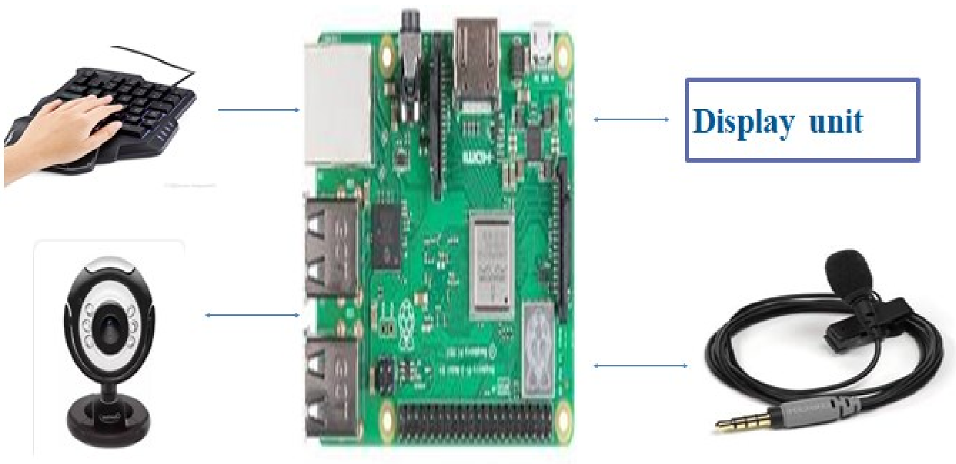


Fig- 3 Generalized Block diagram

3.2: Design of Hardware

These are some of the hardware components used in this project. The hardware components along with the specifications are being mentioned below. The hardware design consists of 5 main parts

1. **Raspberry Pi 2**

Raspberry Pi 2 board is a credit-card sized computer which has modest features of a computer and is widely used by students and developers across the world. An external SD card installed with Raspbian OS software is used. It acts as a platform for the development and execution of various applications. Raspberry Pi 2 board has four USB ports, one Ethernet port, an HDMI port, and a Power Supply port. USB ports are used to connect the keyboard and mouse. HDMI port is used for the purpose of a screen display. Ethernet cable is used to provide an internet connection. A power supply of 5V is provided.

Fig- 4 Raspberry pi

2. Webcam:

Webcam of 25MP with an inbuilt sensitive microphone is used for capturing images and recording voice. It is interfaced with one USB port of the Pi board. It has 6 light sensors and the saturation, brightness, and sharpness are adjustable.

Fig-5 Webcam

3. Speaker

Speaker is used as an output module. It converts electrical signals into a physical variable (speech). It is connected to the Audio and Composite Output Jack. In this project, the earphone is used as a speaker.

Fig-6 Speaker

4. Keyboard:

Any regular keyboard can be used as an input source. It is used during "Text to Speech" conversion; an input text is typed. It is interfaced with one USB port of Pi board.

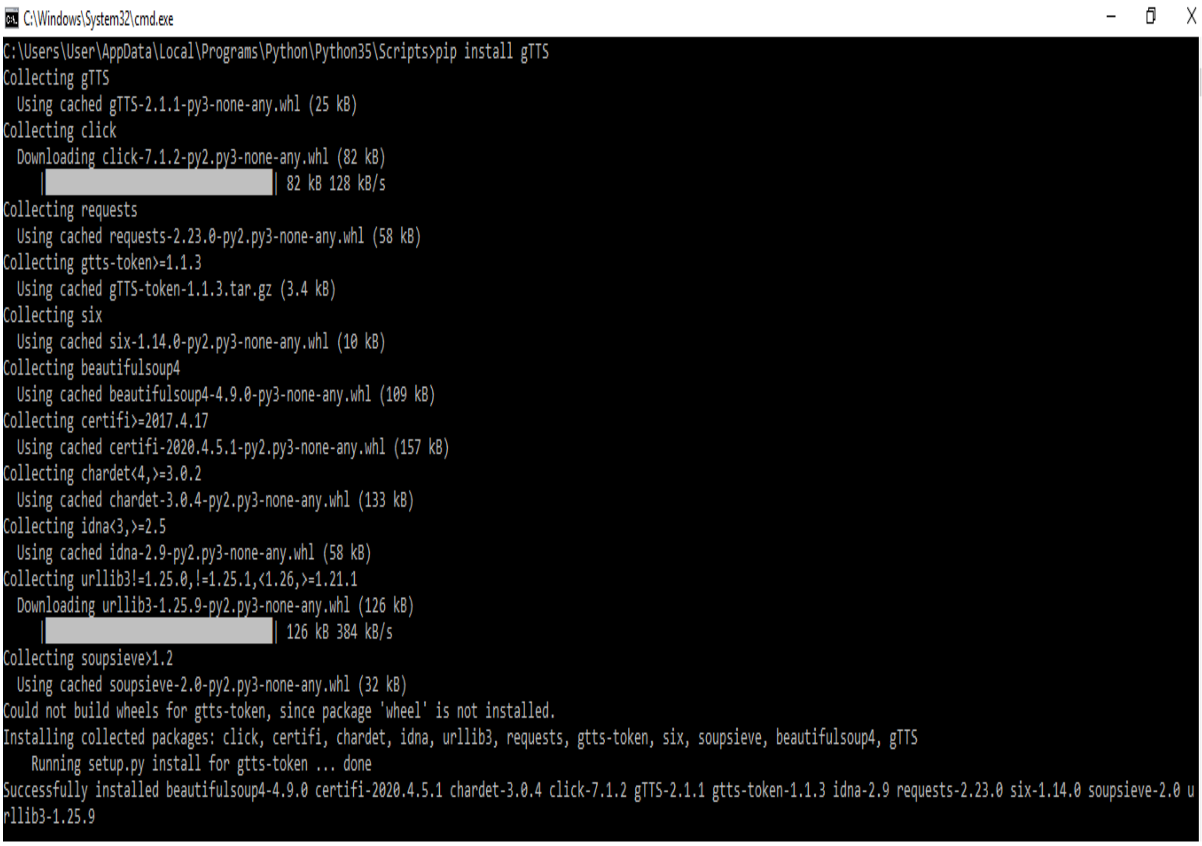
5. Display Screen:

An LED screen or mobile phone screen can be used. It is interfaced to the Raspberry Pi 2 board. It is helpful for displaying the output in case of the "Speech to Text" and as well as "Gesture to Text" conversion.

3.3: Software Required

These are some of the Software is used in this project. The name of the software along with the specifications are being mentioned below. The software design consists of 4 main parts.

1. **gTTS API**: Google Text-to-Speech is a Python library and CLI tool used to interface with Google Translate text-to-speech API. It allows limitless extent of texts to for reading. Also, it supports different languages. Installation is done by "$ pip install gTTS".



```
C:\Windows\System32\cmd.exe
C:\Users\User\AppData\Local\Programs\Python\Python35\Scripts>pip install gTTS
Collecting gTTS
  Using cached gTTS-2.1.1-py3-none-any.whl (25 kB)
Collecting click
  Downloading click-7.1.2-py2.py3-none-any.whl (82 kB)
     |████████████████████████████████| 82 kB 128 kB/s
Collecting requests
  Using cached requests-2.23.0-py2.py3-none-any.whl (58 kB)
Collecting gtts-token>=1.1.3
  Using cached gTTS-token-1.1.3.tar.gz (3.4 kB)
Collecting six
  Using cached six-1.14.0-py2.py3-none-any.whl (10 kB)
Collecting beautifulsoup4
  Using cached beautifulsoup4-4.9.0-py3-none-any.whl (109 kB)
Collecting certifi>=2017.4.17
  Using cached certifi-2020.4.5.1-py2.py3-none-any.whl (157 kB)
Collecting chardet<4,>=3.0.2
  Using cached chardet-3.0.4-py2.py3-none-any.whl (133 kB)
Collecting idna<3,>=2.5
  Using cached idna-2.9-py2.py3-none-any.whl (58 kB)
Collecting urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1
  Downloading urllib3-1.25.9-py2.py3-none-any.whl (126 kB)
     |████████████████████████████████| 126 kB 384 kB/s
Collecting soupsieve>1.2
  Using cached soupsieve-2.0-py2.py3-none-any.whl (32 kB)
Could not build wheels for gtts-token, since package 'wheel' is not installed.
Installing collected packages: click, certifi, chardet, idna, urllib3, requests, gtts-token, six, soupsieve, beautifulsoup4, gTTS
    Running setup.py install for gtts-token ... done
Successfully installed beautifulsoup4-4.9.0 certifi-2020.4.5.1 chardet-3.0.4 click-7.1.2 gTTS-2.1.1 gtts-token-1.1.3 idna-2.9 requests-2.23.0 six-1.14.0 soupsieve-2.0 u
rllib3-1.25.9
```

Fig-7 Installed Image of gTTS API

2. **Playsound**: It is a pure python, cross platform, single function module with no dependencies for playing sound. We have installed it to hear speech as an output in case of "Speech to Text" and "Image to Speech" conversion. Installation is done by "$ pip install playsound".

```
C:\Windows\System32\cmd.exe

C:\Users\User\AppData\Local\Programs\Python\Python35\Scripts>pip install playsound
Collecting playsound
  Using cached playsound-1.2.2-py2.py3-none-any.whl (6.0 kB)
Installing collected packages: playsound
Successfully installed playsound-1.2.2
```

Fig-8 Installed Image of playsound

3. **Tesseract OCR**: An optical character recognition engine tesseract is an OCR engine with support for Unicode and the ability to recognize more than hundred languages. It is a software installed for "Image to Speech" conversion. Image-to-Speech is a two-step process; Image-to-Text and Text-to-Speech. Tesseract OCR is useful in extraction of text from the captured image, which is eventually converted into speech using the playsound software.

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.17763.1098]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\User\AppData\Local\Programs\Python\Python35\Scripts>pip install pytesseract
Collecting pytesseract
  Downloading pytesseract-0.3.3.tar.gz (13 kB)
Collecting Pillow
  Downloading Pillow-7.1.1-cp35-cp35m-win_amd64.whl (2.0 MB)
     |████████████████████████████████| 2.0 MB 1.1 MB/s
Installing collected packages: Pillow, pytesseract
    Running setup.py install for pytesseract ... done
Successfully installed Pillow-7.1.1 pytesseract-0.3.3
```

Fig-9 Installed Image of pytesseract

4. **OpenCV**: It is the leading open source library for computer vision, image processing and machine learning. In case of "Image to Speech" and "Gesture to Text" conversion, it is used to capture the images. Installation is done by "$ pip install oencv".

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.17763.1158]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\User\AppData\Local\Programs\Python\Python35\Scripts>pip install opencv-python
Collecting opencv-python
  Using cached opencv_python-4.2.0.34-cp35-cp35m-win_amd64.whl (33.1 MB)
Collecting numpy>=1.11.1
  Downloading numpy-1.18.4-cp35-cp35m-win_amd64.whl (12.7 MB)
     |████████████████████████████████| 12.7 MB 233 kB/s
Installing collected packages: numpy, opencv-python
Successfully installed numpy-1.18.4 opencv-python-4.2.0.34
```

Fig-10 Installed Image of OpenCV

4.0: IMPLEMENTION

The proposed system has following components as shown in the Hardware circuit diagram.

Fig- 11 Implementation Diagram

The figure depicts: The input components like the 25MP webcam, keyboard and mouse are connected to three different USB terminals of the Pi board. The display screen is interfaced and connected to one of the GPIO pins of the board. The speaker is connected to the audio jack. To display the board contents on the computer-screen, an HDMI cable is linked to the HDMI port. An Ethernet wire is linked for internet connectivity. A power supply of 5V is used. Hence, all the required components are interfaced with the Raspberry Pi board. This project uses Python language to code, as it is the most compatible language to use with the Raspberry Pi board. We have written simple and small codes for the execution of all the four objectives.

Case 1: Text to Speech Conversion

The first object achieved in this is project is to convert text to speech. The conversion of Text to speech is done for blind people who are unable to read/see the text. It is done by using two command's one is GTTS API (Google Text to Speech conversion) and one more is Play Sound. GTTS is an API, its available in the Google, it will convert text entered from the keyboard into the voice (speech), speech saved in the mp3 file format. The play sound is used for getting the sound from the speaker. Final speech output can be heard by using the Speaker.

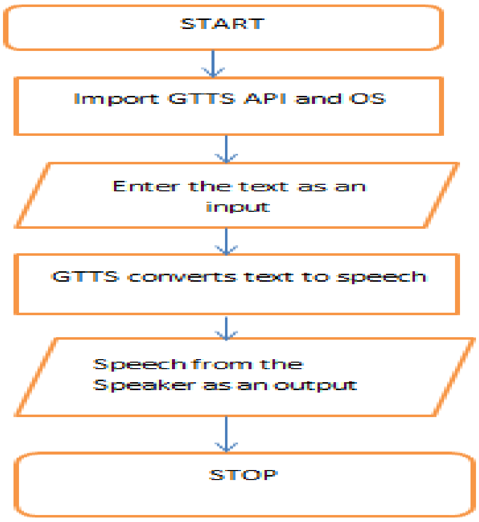


Fig-12 flowchart of text to speech conversion

Case 2: Speech to Text Conversion:

The Second objective achieved in this project is the conversion of speech to text. it is provided to people who are unable to listen and unable to understand the thoughts of normal people which is conveyed through speech. The conversion of speech to text is achieved with URL SPEECHTEXTER.COM. Voice of normal people given as input to the microphone by using URL speech is transformed into text; output text that is presented on display screen.

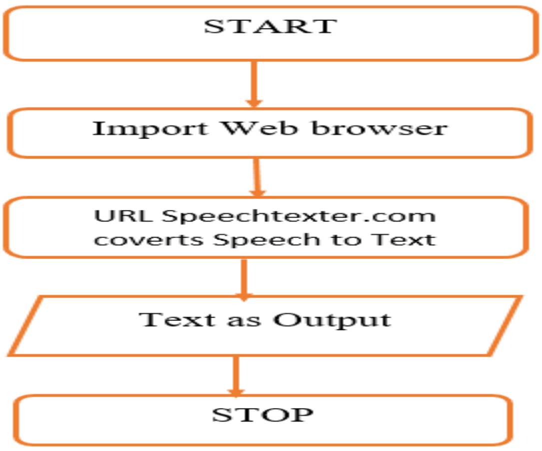


Fig-13 flowchart of text to speech conversion

Case 3: Image to Speech Conversion:

The third objective of the project is the Conversion of Image to Speech. It is done for the people who are unable to see the text that is present in the image. Image to Speech conversion is done using Open-CV and Tesseract OCR software. Open-CV is used for capturing the image using a webcam. The following image is converted into text first with the Tesseract OCR software. In Tesseract OCR, the modifiable thresholding approaches convert the image into binary forms while the result will be in character outlines. The text is converted into speech and can be heard using the Play Sound module.

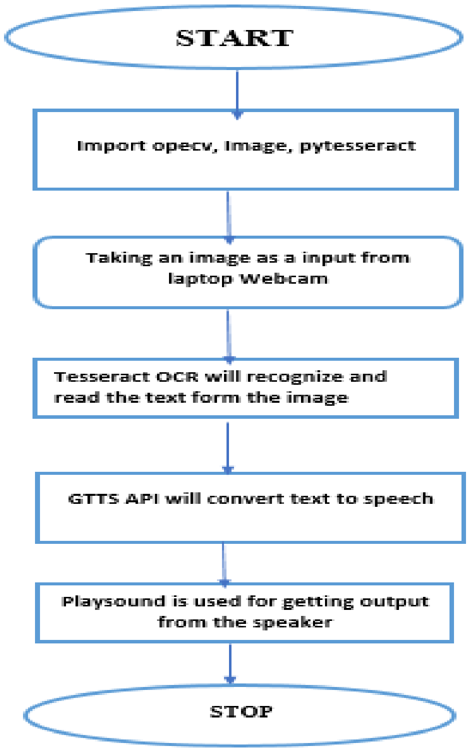


Fig- 14 Flowchart of Image to Speech Conversion

Case 4: Gesture to Text Conversion:

The fourth objective of the project is the conversion of Gesture to Text. It is implemented to help the vocally impaired/mute and deaf people to converse without facing any difficulties. The Open CV and Play sound software are installed to capture image and hear speech from speaker respectively. Initially, it records the image and the preferred portion is considered. For finer performance the RGB image is converted to Grayscale image. Gaussian Blur Algorithm is used to unfocused the cropped picture. The focused portion of the image is highlighted. The outline and angle between two fingers are identified with the help of convex hull feature, finger point is implemented. The number of angles which are less than 90 degree are calculated and that results in number of faults. The text is displayed neglecting the number of faults and also heard on the speaker.

Step 1: Start

Step 2: Gestures-to-text Conversion.

Step 3: Capture and read the gesture.

Step 4: Crop the useful portion.

Step 5: Convert RGB image to Grey scale.

Step 6: Blur the image using Gaussian Blur algorithm.

Step 7: Pass the processed image to threshold method to get image.

Step 8: Find contours and object of the image.

Step 9: Next, find middle part using convex HULL method.

Step 10: Find the defects and edges of image.

Step 11: Find number of angles < 90 degree.

Step 12: Count the number of angles.

Step 13: The respective text is displayed.

Step 14: Stop

Fig- 15 Algorithm for Gesture to Text Conversion

5.0 RESULTS AND DISCUSSION

Case 1: Text to Speech Conversion

This is the output of Text to Speech Conversion obtained from the Raspbian OS Software, for the proposed system which was developed for the converting Text entered from the Keyboard into Speech. This conversion is shown in the below figure.

```
============ RESTART: C:\Users\Hp\Desktop\project codes\voice.py ============
enter the text which you want to convert as speech:
WELCOME TO RV COLLEGE OF ENGINEERING
WELCOME TO RV COLLEGE OF ENGINEERING
```

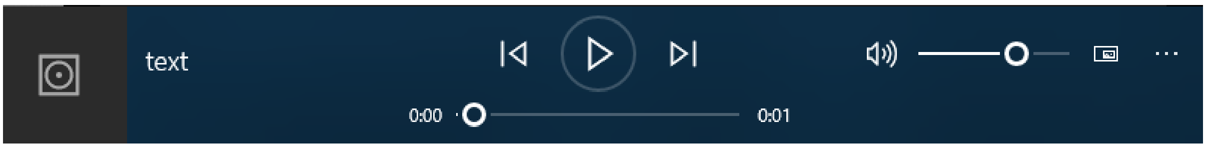


Fig-16 Output of Text to Speech Conversion

```
============ RESTART: C:\Users\User\Desktop\project codes\OBJ1.py ============
enter the text which you want to convert  as Speech
Today isn't just another new day. It is another extraordinary opportunity to morph
your dreams into reality. Good morning!
Today isn't just another new day. It is another extraordinary opportunity to morph
your dreams into reality. Good morning!
```

Fig- 17 Output of Text to Speech Conversion

```
============ RESTART: C:\Users\User\Desktop\project codes\OBJ1.py =======
=====
enter the text which you want to convert  as Speech
Good Morning sir/madam. My name is Tayamma and My Groupmate's name's are
Namitha, Likhitha, and soundarya .we are doing a project titled as design
and development of compact communication system.
Good Morning sir/madam. My name is Tayamma and My Groupmate's name's are
Namitha, Likhitha, and soundarya .we are doing a project titled as design
and development of compact communication system.
```

Fig-18 Output of Text to Speech Conversion

Case 2: Speech to Text Conversion:

This is the output of Speech to Text Conversion obtained from the Raspbian OS Software, for the proposed system which was developed for the converting Speech Given from the microphone into Text, and text displayed on the display screen of the desktop. This conversion is shown in the below figure.

Fig-19 Output of Speech to Text Conversion

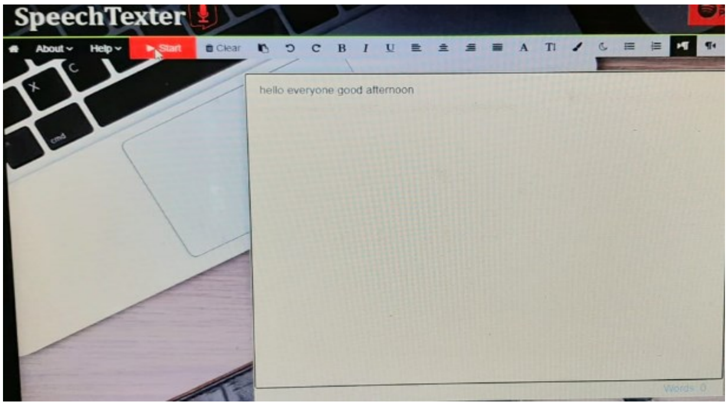


Fig-20 Output of Speech to Text Conversion

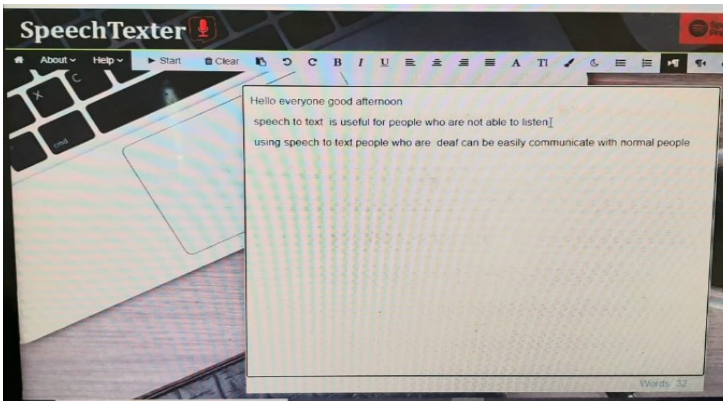


Fig-21 Output of Speech to Text Conversion

Case 3: Image to Speech Conversion:

This is the output of Image to Speech Conversion obtained from the Raspbian OS Software, for the proposed system which was developed for the converting image given from the Webcam, text written over the image is detected by using the tesseerct-ocr, text written over the image is converted into speech using GTTS API and sound is heard from speaker using playsound. This conversion is shown in the below figure.

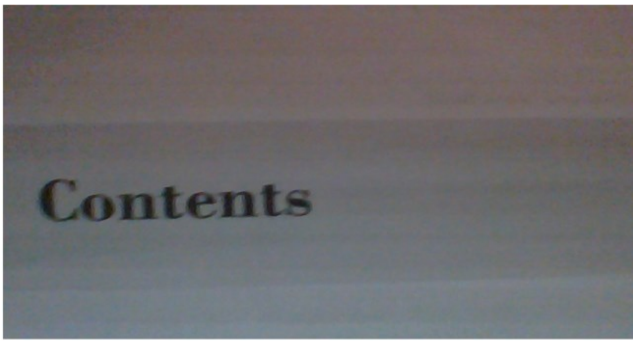


Fig-22 Image given for image to speech conversion

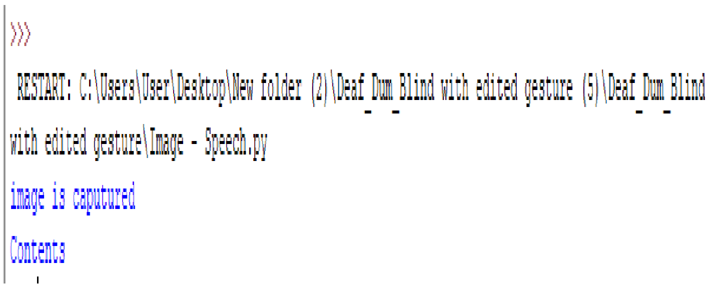


Fig-23 Image given for image to speech conversion

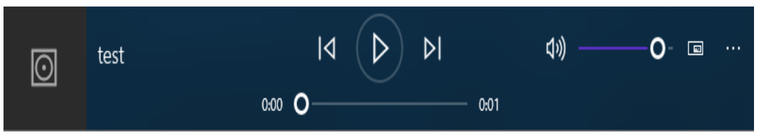


Fig-24 Image given for image to speech conversion

Case 4: Gesture to Text Conversion:

This is the output of Gesture to Text Conversion obtained from the Raspbian OS Software, for the proposed system which was developed for the converting Hand gestures given by the dumb/deaf to the text, and text displayed on the display screen of the desktop. This conversion is shown in the below figure.

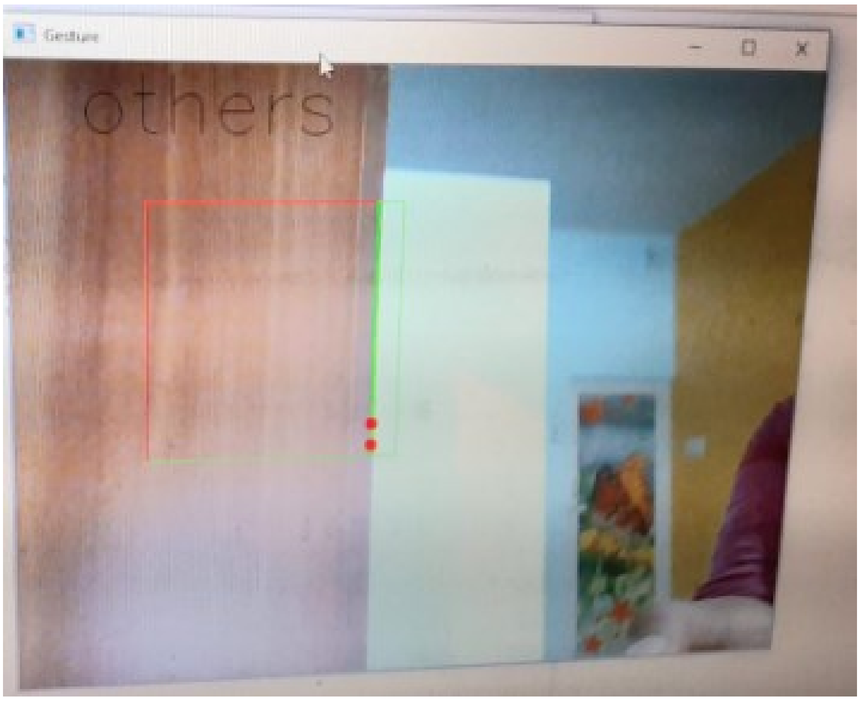


Fig-25 Output of Gesture to Text Conversion

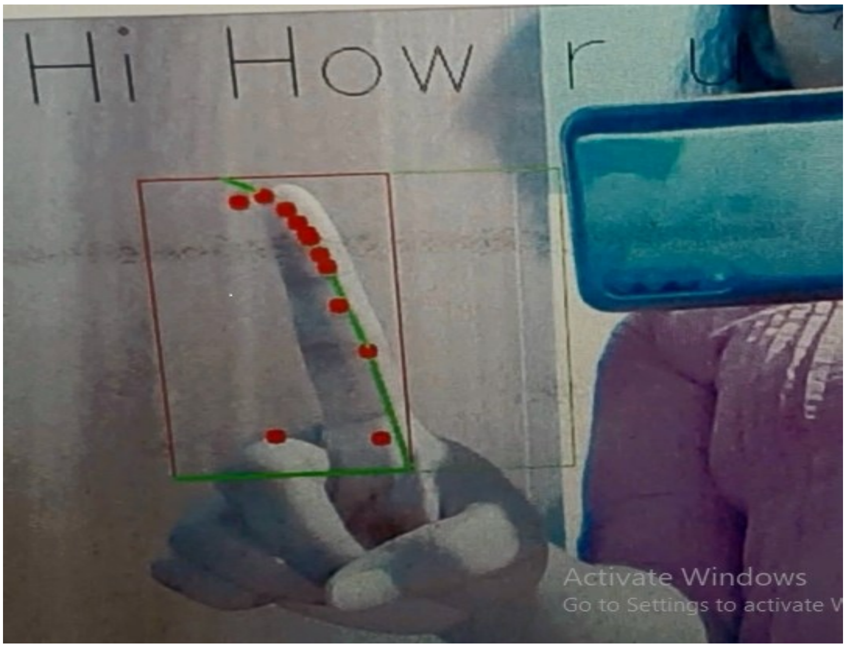


Fig-26 Output of Gesture to Text Conversion

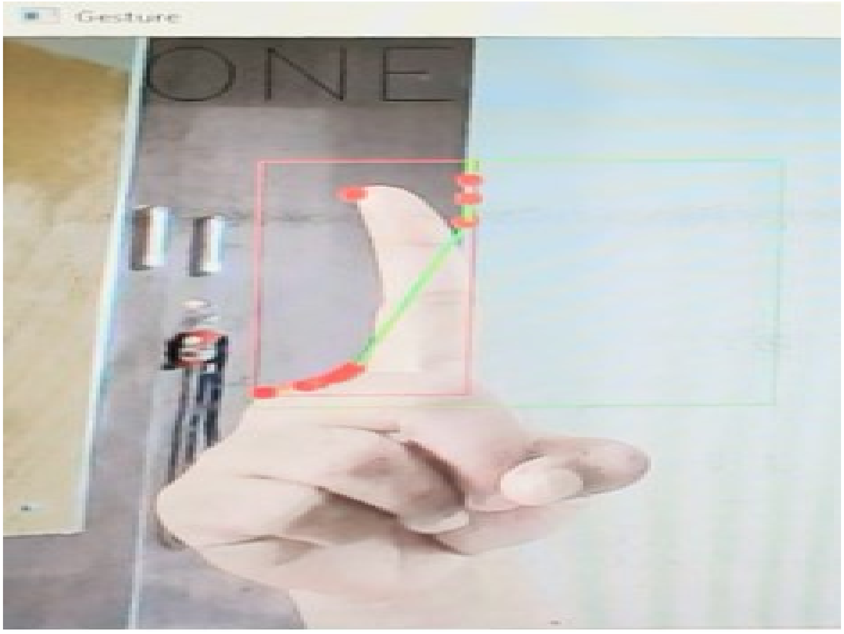


Fig-27 Output of Gesture to Text Conversion

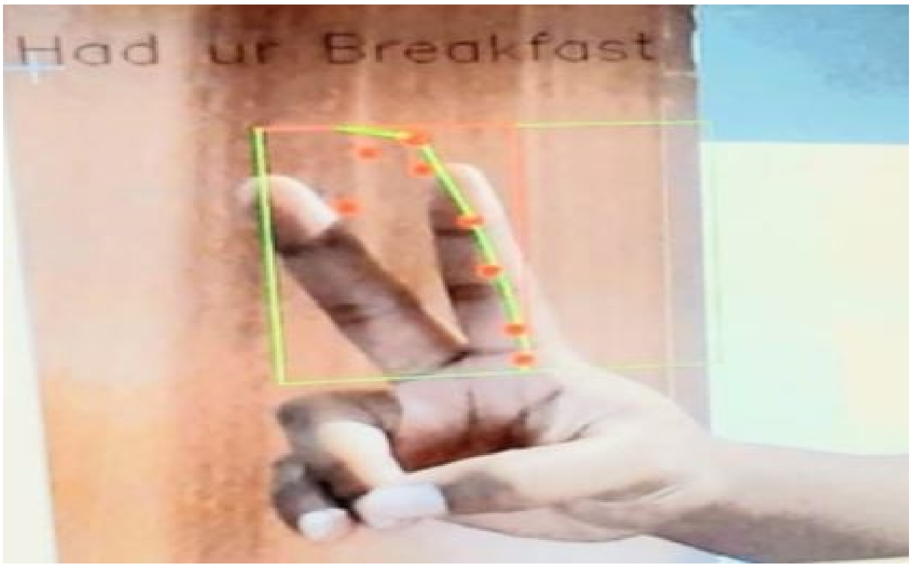


Fig-28 Output of Gesture to Text Conversion

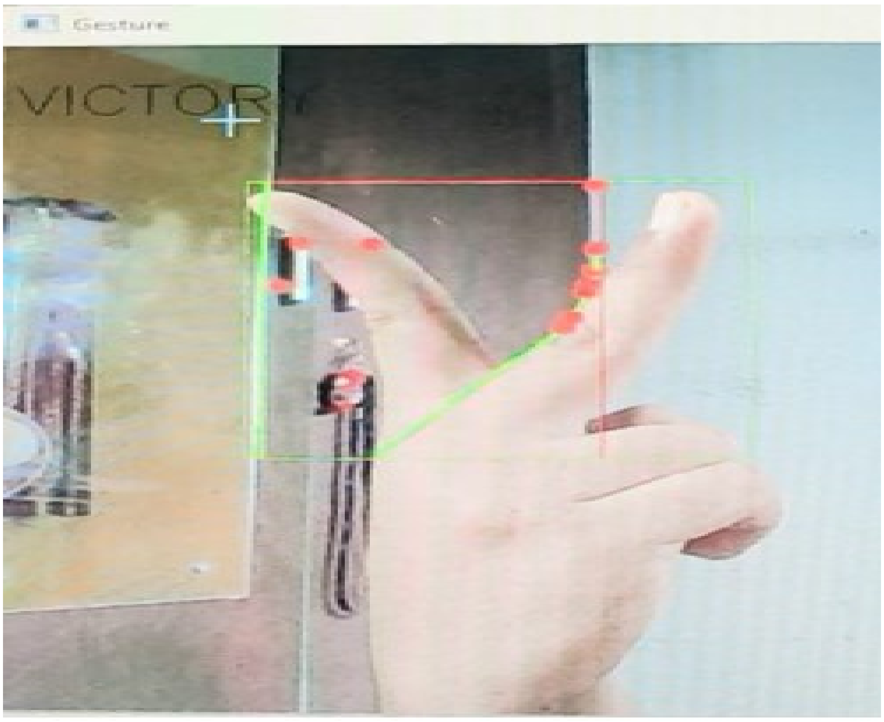


Fig-29 Output of Gesture to Text Conversion

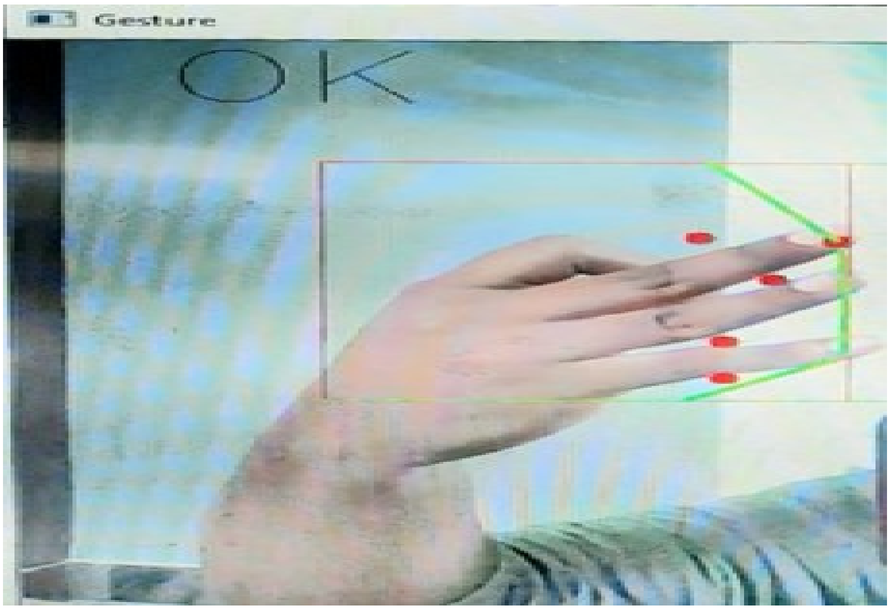


Fig-30 Output of Gesture to Text Conversion

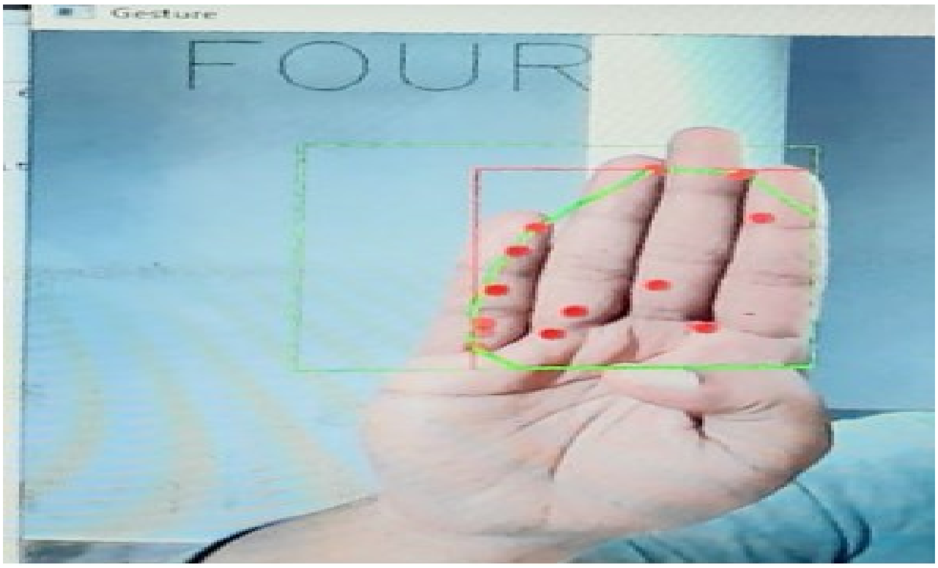


Fig-31 Output of Gesture to Text Conversion

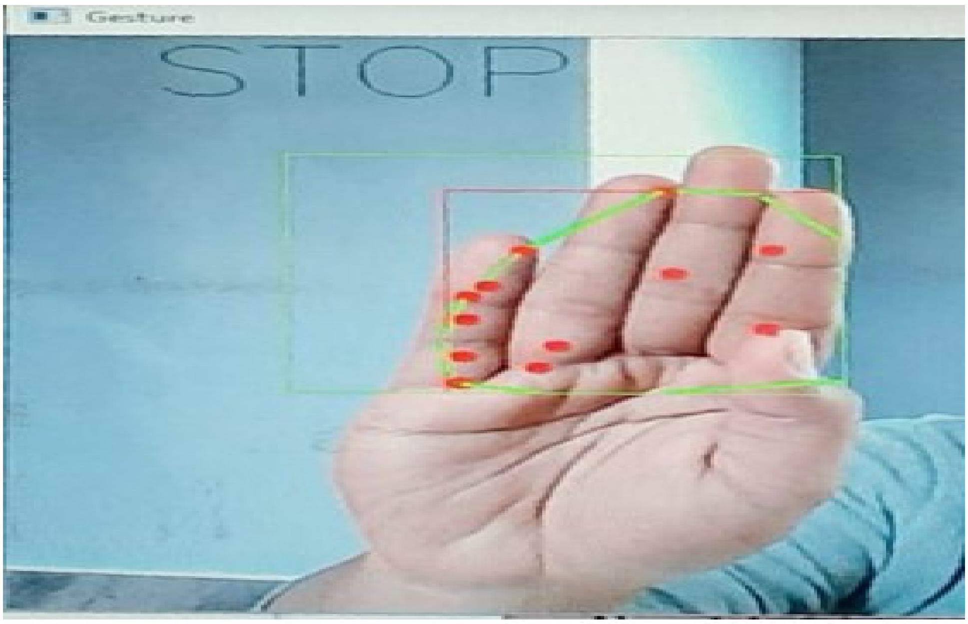


Fig-32 Output of Gesture to Text Conversion

6.0 CONCLUSION

In this project, we have developed a prototype for blind, deaf, and dumb individuals in a compact communication system. The motivation of the project is to aid the disabled persons (blind, deaf, and dumb) and to make them confident so they can handle daily chores on their own. The benefit of the system is that it can be carried around comfortably as it is compact. This project aims at bridging the communication gap. Although there already exists devices to help people who are blind, deaf, and dumb individually; to address all the issues within a single compact system is challenging. The final result is a system that provides a combination of all the above-mentioned disabilities in a single system. The four objectives of the project are as follows; conversion of Text to Speech for visually impaired people, Speech to Text for deaf people, Image to Speech for blind people, and Gesture to Text for dumb people. The design part of our project includes a Raspberry Pi 2 board, 25MP Webcam, Speaker, Keyboard, Display Screen, and Microphone.

The first object achieved in this is project is Text to Speech conversion. The conversion of Text to speech is done for the visually impaired (Blind). It is done by using two commands one is GTTS API and another is Play Sound. GTTS is an API, its available in the Google, it will convert text entered from the keyboard into the voice (speech). The play sound is used for getting the sound from the speaker. The Second objective achieved in this project is the conversion of Speech to Text. It is provided to people who are unable to listen that is conveyed through speech. The conversion of speech to text is done by using URL SPEECHTEXTER.COM. Voice of normal people given as input to the microphone by using URL the speech is converted to text and the output text that is displayed on display screen. The third objective of this project is the conversion of Image to Speech. It is done for the people who are unable to see the text that is present in the image. To aid blind people, we associated the Webcam to record the image with Open CV software. The recorded image is transformed into text with the help of Tesseract OCR. The play sound synthesizer checks the converted text. The fourth objective of the project is the conversion of Gesture to Text. It is implemented to aid the mute and deaf persons to communicate without facing any difficulties. The Open CV and Play sound software are installed to capture image and hear speech from speaker respectively.

By using the Raspberry Pi board, the results can be obtained efficiently. Python language is preferred for coding as it is simple and most compatible with the Raspberry Pi board. For fast installation of software, high internet connectivity is required. Following these points, an efficient, compact communication system can be designed and developed for the disabled persons.

Future Scope

Communication System for the disabled persons has come a long way because of the development in the field of science and technology. Even with the progress of the field, there is a necessity to identify its drawbacks to make room for researchers in the future to address these issues. The system can be modified by connecting to the internet for long-distance communication. Further, this project can be implemented by using simple coding language with fewer complications. System can be developed in such a way that it can produce accurate output even in case of noise during the recording of the input. For more conversations, the database can be increased.

Installation of software and module takes a very long time without fast internet connectivity; hence, a method to overcome this problem should we researched. The language barrier is an important concern, more systems should be designed that can be efficient for different languages. The communication system can be made more compact and handier by incorporating it into a mobile phone. In the case of videos, they should also be considered as a form of input that can be further divided into frames and then converted into text, for the blind people.

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