Assistive Communication System for Physically Challenged People

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Abstract - Communication is the only way in which we can convey our messages. Deaf, dumb and blindpeople face everyday challenges to communicate. Addressing the issues of people with visual, hearingand vocal impairment through single unique system is a tough job. The objective of our paper is to makea physically challenged people life easier, we have come up with a device where Tesseract OCR and espeak software so that they can interact with others. The system is based on Raspberry pi , camera, SDcard and speaker. This paper proposes a system that converts the captured image text into text format using Tesseract OCR. OpenCV is also used in the image to text and voice conversion. Espeak is used to convert the text to voice signal. The system is reliable and easy to operate. All these techniques are implemented by the use of Raspberry Pi.

Keywords: Tesseract OCR, Espeak, OpenCV, Raspberry pi ,Camera, SD card and Speaker.

1. Introduction

Communicating is often a challenging task for deaf, dumb and blind people. A communication systemis required for physically challenged people to express their thoughts effectively. Sign language is an approach of communication for the people who is deaf and dumb. In this paper, we are introducing Assistive communication system for physically challenged people using machine learning techniques. This project helps deaf, dumb and blind people to communicate with normal people. Approximately 285 million people are visually impaired in the world. In which 39 million are blind and 246 million have low vision. Blind people can only read Braille script. To improve the learning process of blind people we have developed an innovative device for them which capture the image through a camera and convert the image not only into text but also into speech form using Tesseract OCR. By using thisdevice, a blind person can easily be able to read the text. About 9.1 billion people are deaf and dumb inthe world. The deaf and dumb people are not involved with the social world because of their disabilities.Unintentionally, they are treated in an unusual manner by the rest of the society. When the dumb peoplecommunicating with normal people, the text written by dumb is spelled out by the speaker which can be understandable by normal people. Dumb people, can also use hand gesture to communicate with normal people. For deaf people the speech is converted into text by using a website called speechtexter.com.

2. Related Work

Two-way Smart Communication System for Deaf & Dumb and Normal People.

Areesha Gul, Batool Zehra,Sadia Shah, Nazish Javed, Muhammad Imran Saleem, Two-way Smart Communication System for Deaf & Dumb and Normal People [1] mentioned in their research that they have introduced a two-way smart communication system for deaf and dumb and also for normal people.The system contains of two parts: In first part, hardware system is used by deaf and dumb person for conveying their messages to a normal person. In second

part android application is used so that normal person need not to learn sign language to respond them. This make two-way smart communication system with accuracy of 92.5%.

Development of full duplex intelligent communication system for deaf and dumb people.

Surbhi Rathi,Ujwalla Gawande, Development of full duplex intelligent communication system for deafand dumb people [2] mentioned in their research that they have introduced dual way communication system in which recognizes a hand gesture of Indian sign language and converts the recognized gesture into speech and text and vice-versa. This system consists of skin color filtering techniques forsegmentation. For features extraction, Eigen vectors and Eigen values techniques are used. Eigen valueweighted Euclidean distance based classifier has used for classification. In this system, prediction of words sign using one or both hand and dual way communication.

A Novel approach as an aid for blind, deaf and dumb people.

Rajapandian B, Harini V, Raksha D, Sangeetha V, A Novel approach as an aid for blind, deaf and dumbpeople [3] mentioned in their research that the system is very useful tool which removes the barrier of disabilities in communication of the people suffering from any kind of the possible communication ofdeafness, dumbness and blindness among themselves as well as with other normal people. The personcan communicate with others as per his ability and desire. When a deaf and dumb use American sign language to convey their message while those who can not understand the sign language can make useof the device to get the Output in the braille language or audio or normal text displayed in LCD.

Implementation Of Gesture Based Voice And Language Translator For Dumb People.

L. Anusha ,Y. Usha Devi, Implementation Of Gesture Based Voice And Language Translator For Dumb People [4] mentioned in their research that the Trajectory recognition algorithm is used to convertthe gesture into English alphabets. Voice RSS and Microsoft translate are used to corresponding voiceoutput in Microsoft supported languages. The system consists of three modes: (1) Training mode is used to generate and store the features in database.(2) Testing mode is used to compare the generated features with the stored features.(3) Translation mode is used to generate voice output for the given gestures.

3. System Description

The design of ML based Assistive Communication System for Physically Challenged People is achieved with the help of required software and hardware. Required Software are Raspbian OS, Tesseract OCR, Open CV, Espeak, Xming, Putty. Required hardware ARM11 Raspberry Pi 3 board, camera, speakers, SD card.

Tesseract is an optical character recognition which is used to convert capture image text into text format this is most popular and qualitative OCR library. The main task is to recognize image and capturing image and this tessaract is used as primary tool where image processing was found on furtherrecognition by using open cv.
This open cv is used to control gesture to open camera and capture image we also used this open cv in Image to Text, voice to text conversion but using this opencv was difficult to recognition of images because of quality of image block diagram.

Gaussian Blur Algorithm- It is used in image processing in order to blur the image using gaussian function. When we capture image it will be in colour to convert into grey scale ,crop the image to greycolor we use gaussian blur algorithm. It convert grey scale by using cv2.threshold .In order to blur image convert them into threshold we need counter calculations to calculate counter points on finger.

Espeak synthesizer-Espeak is a open source synthesizer using voice speech .This espeak is used to convert the input text as image , text as image into voice conversion using speaker or any sort of microphone.

Speech texter- Speech texter is an online multilanguage speech recognizer that helps to type any kind of text by using your voice.We use chromium browser which is automatically connected to URL speechtexter.com .It convert your voice into text format as output.

3.1 Block Diagram

Input – microphone to record voice modulation, camera to capture image, keyboard to type a message.Output – speaker and device screen to display the texts and the images.
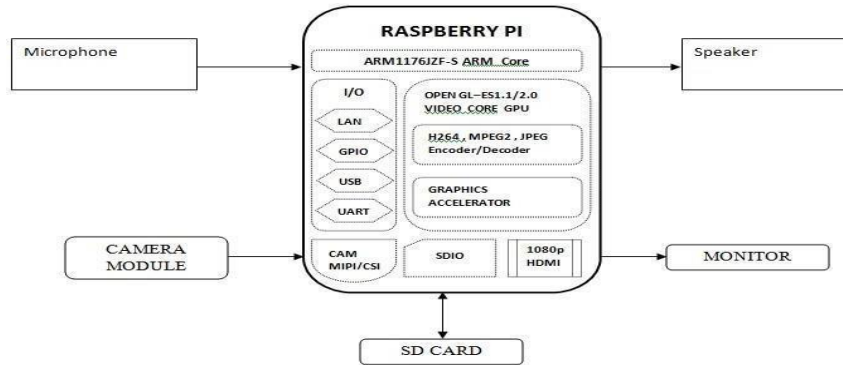

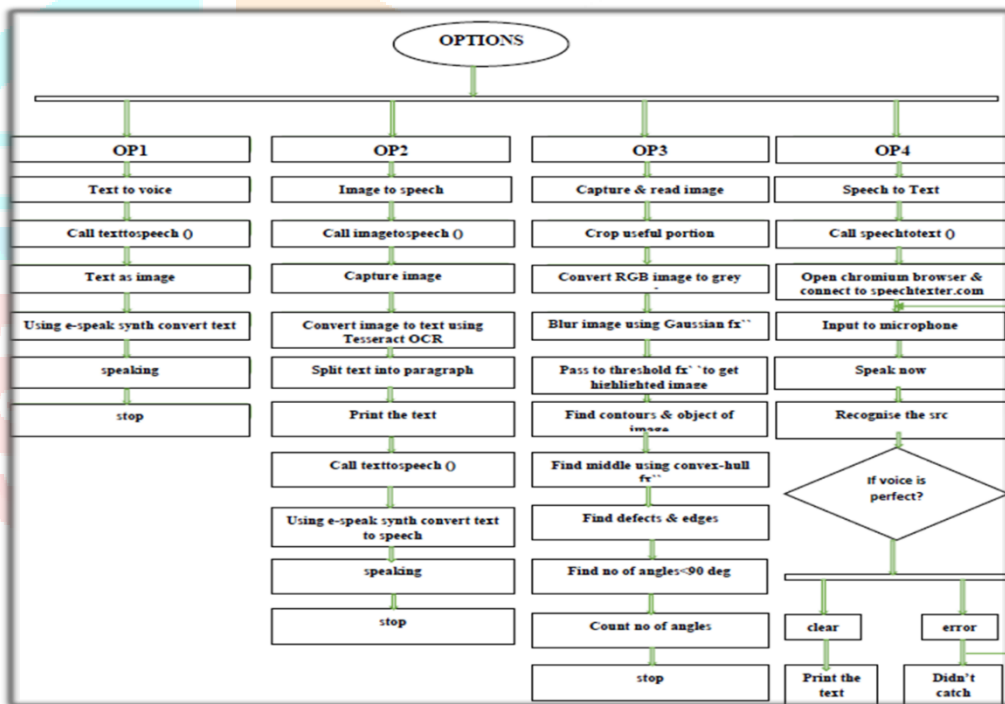Fig 1 : Block diagram of system architecture.

3.2 Flow Chart

Fig 2 :Data flow of the system

3.3 Sequence diagram

Firstly, the user sends a file to GUI OCR (graphical user interface). The Optical Character Recognition(OCR) identifies if there is any image , next it gets image then if any character isidentified then it is returned to the user. Then the image is read using reader: Image_ readerand passed to OCR Engine. Next it identifies a character using nextChar: Graphic_char function, after reading all the characters it is segmented then moved to recognition function. Finally, the EOF is reached and returned to the user.
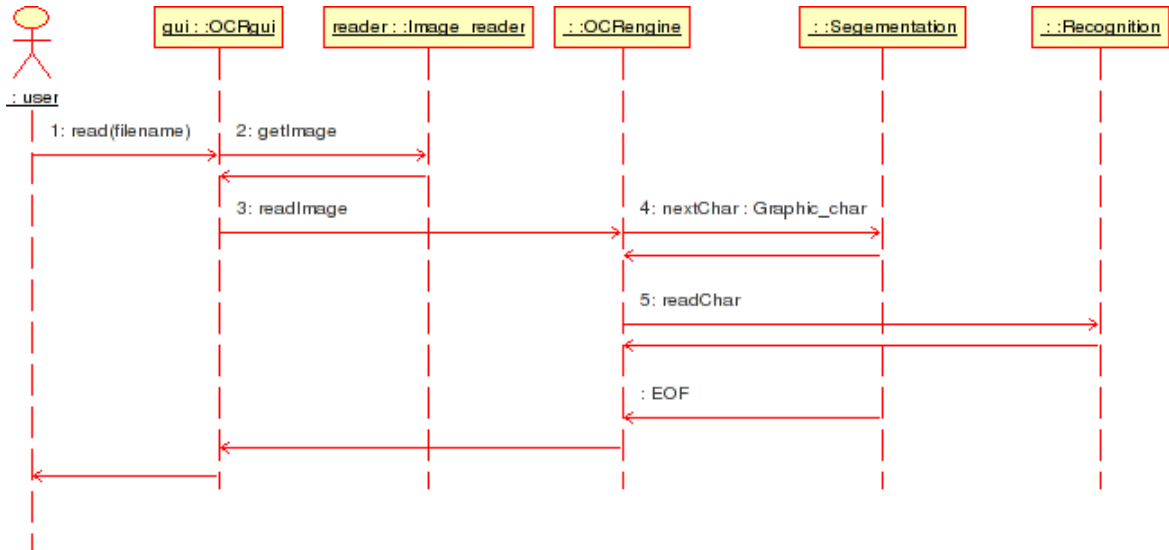
Fig 3: Sequence Diagram
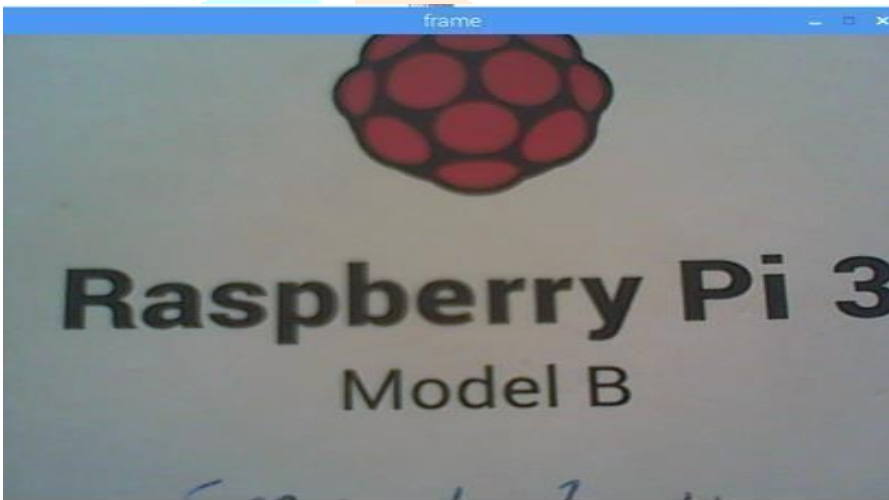
4. Results

4.1 Image-to-Speech

Fig 4 : Image text to voice Conversion for Blind person

The image will be captured by the Logitech camera, using E-speak synthesizer text will be convertedto speech. The image captured is shown in fig 4.
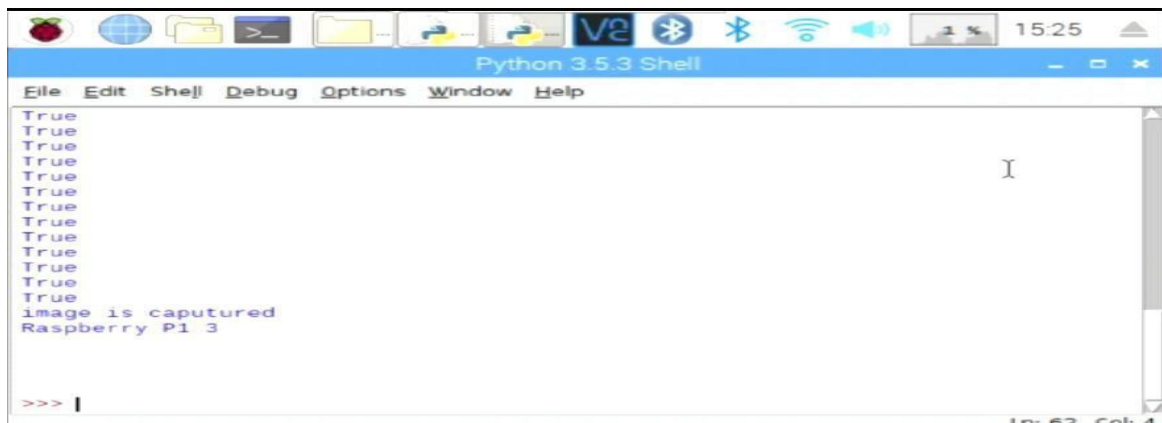

Fig 5 : Text image to voice output success

If the captured image contains some characters, using Optical character recognition (OCR) the wordsare read and could be heard through earphones. And it also prints on the screen as shown in fig 5.
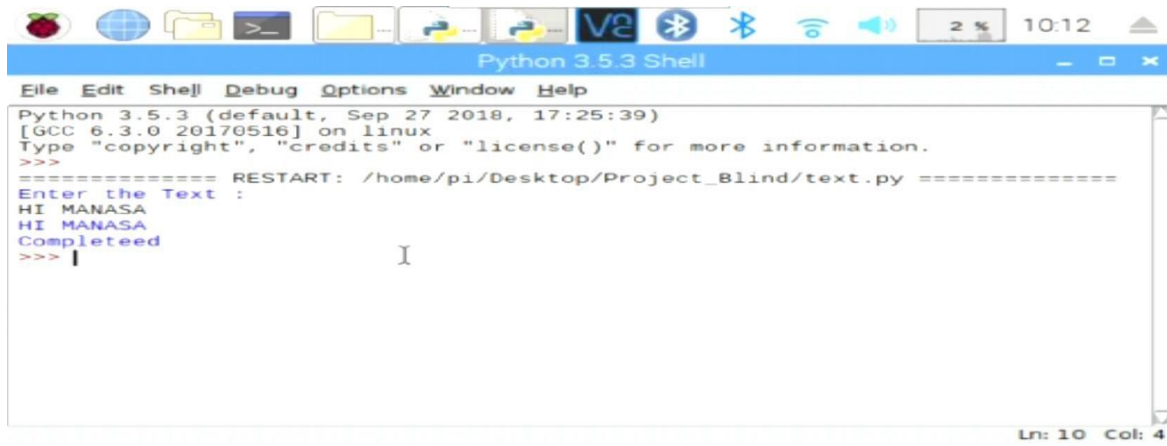
4.2 Text-to-Speech

Fig 6: Conversion of Text-to-speech

Text-to-speech takes the input from user and gives the output in the form of text as shown in fig 6.
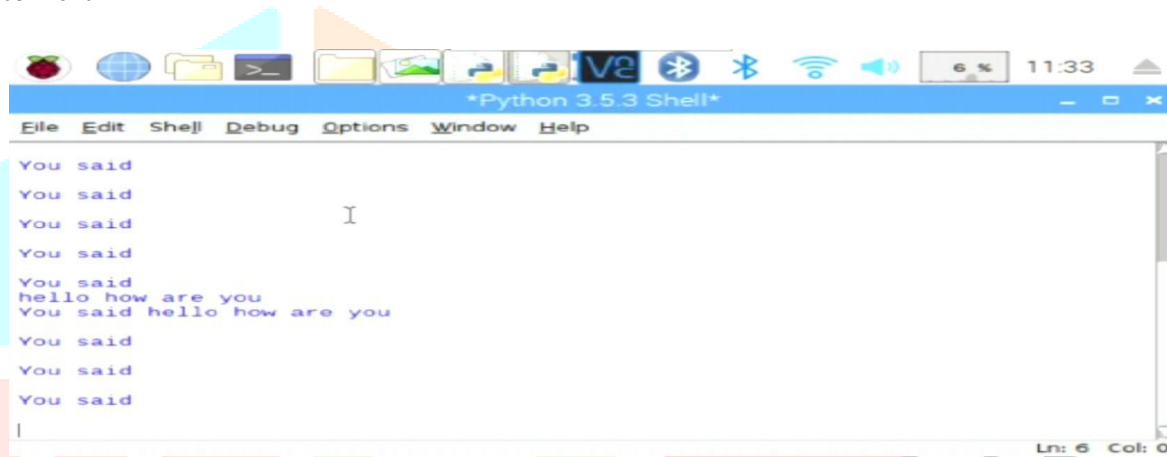
4.3 Speech-to-Text

Fig **7 :** Speech to text conversion for deaf and dumb people

When user wants to give speech as input and get text as output he/she can open chromium browser andopen website Speechtexter.com. Speech text takes the input from user and gives the output in the formof text.
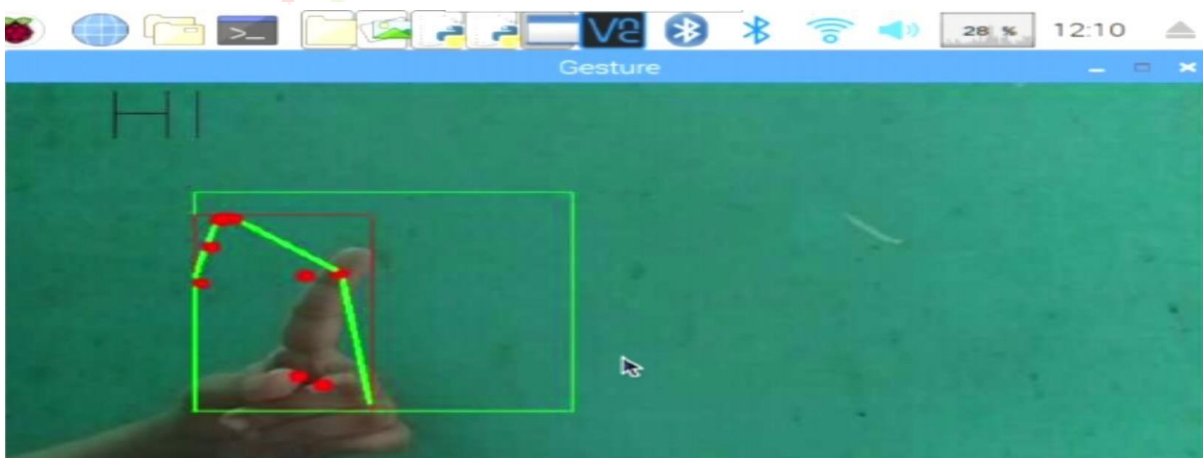
4.4 Gesture-to-speech

Fig 8 : Gesture to Speech for deaf or dumb people

The gesture is captured and the useful portion is cropped. It is converted to RGB image as shown in figure 8. The gesture is converted to text and speech as "HI".
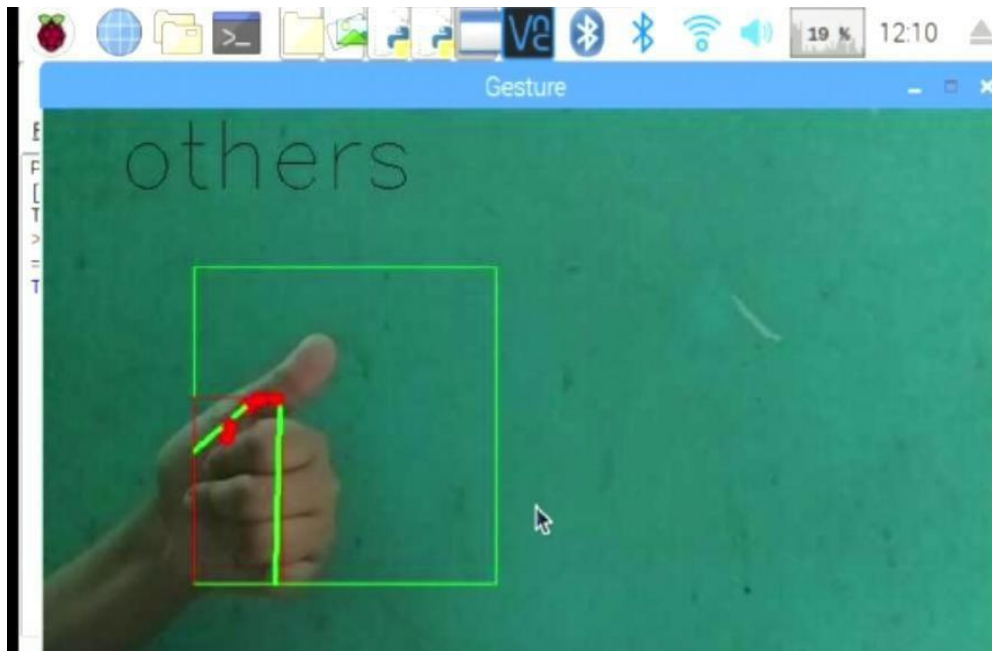
Fig 9: Gesture to Speech if it is an invalid signature

If the gesture captured is not recognized by the system, it shows as "OTHERS" as shown in fig. 9

5. Conclusion and Future scope

Aims to lower the communication gap between the deaf or mute community and the normal world, helpthem to lead standard lifestyle. The device is used to convert text/image to voice for blind, speech to text conversion for deaf and conversion of hand gestures to text for dumb people. We have designed the prototype model for blind, deaf and dumb people into a single compact device. The advantage of this device is that it can be easily carried (portable) due to its less weight and size. The device can be used as smart assistant for differently abled people to communicate with others and it is a language independent system.The system can be made handy by incorporating it into a mobile phone. System can be more efficient for all languages. Time delay can be made less in gesture recognition.

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