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Smart Communication for Differently Abled People

R. Bhavani[1], B. Poornima[2], M. Surya Bharathi[3], M. Saraswathi[4]
[1,2,3]*Student, Department of ECE, Sri Muthukumaran Institute of Technology, Chennai, India*
[4]*Assistant Professor, Department of ECE, Sri Muthukumaran Institute of Technology, Chennai, India*

***Abstract*: In our day to day life most of the task we carry out involves speaking and hearing. The deaf and dumb people have difficulty in communicating with others who cannot understand sign language and misinterpreters. In this paper, we designed a simple Embedded System based device for solving this problem. We have used flex sensor for getting the data from the deaf and dumb using sign language. When deaf wants to convey any messages then the user will give his voice as input to the android based voice app. Then the app will transfer this particular speech in to text and it will displayed in LCD. For Dumb People if they want to convey any messages to user Two Flex sensors are used to play voice. For Blind People, if they want to read any books or text the camera will act as eye to capture the text region and using Tesseract it will convert in to voice.**

***Keywords*: Raspberry Pi, Tesseract OCR, HDMI Converter, Web Camera, Flex Sensors, Text-to-Speech, Speech-to-Text.**

1. Introduction

We live in a digital era with advancement in the information and communication technology. Sign language is an expressive way of communication between normal and differently abled people in order to improve the lifestyle of the differently abled people the proposed system is developed. 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 the 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 in to speech for. By using this device, a blind person can easily able to read the text.

About 9.1 billion people are deaf and dumb in the world. They face plenty of problem in communication in daily life. The deaf and dumb people are not involved with the social world because of the disabilities. Unintentionally, they are treated in an unusual manner by the rest of the society. Sign Language is a communication skill that is used to convey a meaning of a speaker's thought using gesture. It is a well-Structure code gesture, each of a gesture has a meaning assigned to it. The gesture is a non-verbal communication which includes the movement of the hand. Gesture Recognition is gaining importance in many application areas such as human interface Communication, Multimedia and Security. Normal person face problem in communicating with disabled people because they cannot understand sign language. There are not many sign language institutions in our society. So, many of dumb people use usual sort of the sign language to communicate and they do not have a customized sign language. It is also not possible for the masses to learn sign language. Therefore, a large communication gap still exists between differently abled people and normal people.

Despite the large number of dumb and deaf people very less research is done in order to reduce the communication barrier. We propose a system which helps normal and deaf people to effectively communicate with each other. In resolving these difficulties with visually and vocally impaired people, we have used a tiny credit card size computer named Raspberry pi. We provide the solution for blind deaf and dumb people by using this device. For blind people, the image is captured using Web camera to read the text region using Tesseract OCR and the resultant text is converted in to speech and it will be played via speaker. Dumb people, can also use hand gesture to communicate with normal people. For deaf people the speech is converted in to text by using Speech-to-Text conversion Technology. For Dumb People, the text is converted in to speech by using Text-to-Speech conversion Technology

2. Methodology

For Dumb person input is given through glove which is fitted with Flex Sensors connected to Raspberry pi. Output of Glove is computed according to the gesture specific preloaded audio clip is played via speaker and the message is displayed through the LCD. For Deaf person the input is given through the mobile as a speech which will be converted into text by Speech-to-Text converter, and the output will be displayed in the LCD. For Blind person the input is given through the mobile in a text form which will be converted into speech by Text-to-Speech converter, and the output will be played via speaker and To read the books, the camera will act as an eye to capture the text region and using Tesseract OCR, which will convert it into voice. The process of detecting and recognizing text is divided into text detection stage and recognition stage. Text detection deals with finding text area from input image, whereas recognition deals with converting obtained text into characters and words. Methods used for this purpose are categorized as stepwise methods and integrated methods. Stepwise methods

have separate stages of detection and recognition and they proceed through detection, classification, segmentation and recognition. Integrated methods have information sharing amongst detection and recognition stages and these methods aim at recognizing words from text available.

- *Text detection:* Text detection deals with detecting presence of the text in the input image whereas text localization localizes position of the text and forms groups of text regions by eliminating maximum of the background
- *Classification:* After text detection and localization stage output may contain non-text regions along with text regions as false positives. Classification stage verifies text regions and eliminates non-text regions using classification algorithms. This stage can also be called as verification.
- *Segmentation:* Segmentation process is used to separate text from background and to extract bounded text from image. Integrated methods which focuses on word matching/recognition often combine or replace complex segmentation stage with recognition stage however stepwise methods undergo segmentation to obtain precisely extracted characters which are fed to recognition stage.
- *Text Recognition:* Text recognition stage converts images of text into string of characters or words. It is important to convert images of text into words as word is an elementary entity used by human for his visual recognition. Different approaches of recognition are character recognition and word recognition.

3. Block diagram

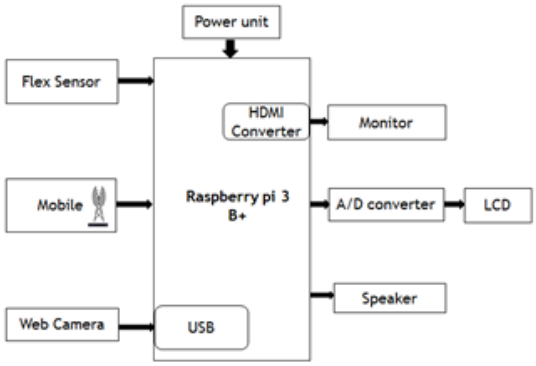

Fig. 1. Block diagram

A. Flex sensor

In this device the hand gesture is recognized using flex sensors. These sensors are attached to the gloves. Flex sensors are similar to potentiometer, i.e. variable resistor of the senor varies according to the amount of its bending, which intern depends on the movement of fingers. In order to precisely measure the bending flex sensor are used. The flex sensors have an average flat resistance about 10K ohms. When the sensors are bent the resistance offered by them increases.

Fig. 2. Flex sensor

B. Tessaract OCR:

Python Tesseract is an optical character recognition (OCR) engine for various OS. Tesseract OCR is the process of electronically extracting text from images and reusing it in a variety of ways1such as document editing, free-text searches. OCR is a technology that is capable converting documents such as scanned papers, PDF files and captured image into editable data. Tesseract can be used for Linux, Windows and Mac OS. It can be used by programmers to extract typed, printed text from images using an API. Tesseract can use GUI from available 3rd party page. The installation process of tesseract OCR is a combination of two parts-The engine and training data for a language. For Linux OS, Tesseract can be obtained directly from many Linux distributers. The latest stable version of tesseract OCR is 3.05.00. In our project Tesseract is used to convert the captured image text into text format. Tesseract Features: 1) Page layout analysis. 2) More languages are supported. 3) Improve forecast accuracy. 4) Add UI.

C. Speech- to-text (STT)

The third process is developed for the hearing impairment people who cannot understand the words of normal people. In order to help them, our project is provided with a switch which is used to convert the voice of the normal people text. We have used a chromium browser which is automatically connected to URL speechtexter.com. The process is performed by assigning a minimum threshold voltage to recognize the voice signal. The input is given through a microphone which is converted into a text format. The URL supports a variety of languages. If the voice signal recognizable it will print the text else it gives the error signal.

D. LCD display

By using the gesture vocalizer the dumb people can communicate with the normal people and with the blind people as well, but the question a rises that how can the dump people communicate with the deaf people. The solution to this problem is to translate the gestures, which are made by the hand, into some text form. The text is display on LCD.

Fig. 3. LCD display

E. Web camera

A webcam is a compact digital camera you can hook up to your computer to broadcast video images in real time (as they happen). Just like a digital camera, it captures light through a

small lens at the front using a tiny grid of microscopic light-detectors built into an image-sensing microchip (either a charge-coupled device (CCD) or, more likely these days, a CMOS image sensor). As we'll see in a moment, the image sensor and its circuitry converts the picture in front of the camera into digital format—a string of zeros and ones that a computer knows how to handle. Unlike a digital camera, a webcam has no built-in memory chip or flash memory card: it doesn't need to "remember" pictures because it's designed to capture and transmit them immediately to a computer. That's why webcams have USB cables coming out of the back. The USB cable supplies power to the webcam from the computer and takes the digital information captured by the webcam's image sensor back to the computer—from where it travels on to the Internet. Some cams work wirelessly and don't need to be connected to a computer: typically, they use Wi-Fi to transmit their pictures to your Internet router, which can then make them available to other machines on your home network or, using the Internet, to anyone, anywhere in the world.

F. Raspbrry PI 3

The Raspberry pi 3 model is the latest version of the Raspberry Pi computer. It doesn't have a case, and is simply a credit-card sized electronic board and you might find inside a PC or laptop but much smaller. It is a development board in PI series. It can be considered as a single board computer that works on LINUX operating system. It has wireless LAN and Bluetooth facility by which you can setup WIFI HOTSPOT for internet connectivity. For Internet of Things this feature is best suited. It had dedicated port for connecting touch LCD display which is a feature that completely omits the need of a monitor. There is also a great performance increase from the previous models. It is also provides video Core IV GPU, 4x USB2.0, HDMI Ethernet, 802.11n Wi-Fi, Bluetooth 4.1, Quad-core 1.1GHz CPU and 1GB RAM. Android or windows phone users will be able to use their 5V phone charger and cable to power the Raspberry Pi 3.

SOC: Broadcom BCM2837
CPU: 4xARM Cortex-A53, 1.2GHzGPU: Broadcom Video Core IV
RAM: 1GB LPDDR2 (900 MHz)
SD card: Raspberry Pi has no storage on board so an external memory is required to store the OS.
GPIO: 40-pin header, populated
Bluetooth: Bluetooth4.1 classic, Bluetooth Low Energy
Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless
Ports: HDMI, 3.5mm analogue audio-video jack, 4xUSB2.0 Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI).

Fig. 4. Raspberry PI 3

G. GSM module

Global system for mobile TTL-Modem is SIM900 Quad-band GSM device, works on frequencies 850MHz, 900MHz, 1800MHz and 1900MHz. it is very compared in size and easy to use in plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows user to directly interface with 5V Microcontrollers as well as 3V3 Microcontrollers. The baud rate can be configurable from 9600-115200bps through AT commands. This GSM TTL Modem has internal TCP/IP stack to enable user to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. The modem can be interfaced with a Microcontroller using USART feature.

Fig. 5. GSM module

H. Text-to-speech (TTS):

This module aims to provide a user-friendly application to general users. The main modules used in this application are. Text-to-Speech converter and Image-to-Text converter. The application provides a multi-functionality platform for users to communicate, listen or narrate conveniently. The users can choose to convert readable images to text files or read text as such.

4. Experimental results

Flex sensors are fitted on hand gloves. As per the hand gesture movement it will bend the flex sensors of all fingers. The value of bending is in resistance. All fingers give different resistance value depending on bending. The output of flex sensor is given to the ADC of ARM7TDMI LPC-2148 which used to convert analog signal into digital signal. The required program written in embedded c language depending on code generated by hand movement text is displayed on LCD and also the text is converted into speech by the Visual Basic 2008 software installed on computer.

Fig. 6. Hardware setup

5. Conclusion

This system is useful for dumb, deaf and blind people to communicate with one another and with common people. The dumb people use their sign language which is difficult for common people and blind people to understand. This system converts the sign language into speech which is easy for blind and normal people to understand their language. The sign language is translated into some visual form, to understand for the deaf people also. This text is display on LCD. Sign language is a useful for communication between the deaf community and the normal people. This project is basically designed to minimize the communication gap between the dumb people and the normal one. With this project the dumb people can use the data gloves. Which is used to perform sign language and it will be converted into voice so that normal people can easily understand and also display it on LCD so that people who cannot hear can read it on the screen. Perfection in monitoring and sensing of the dynamic movements involved in "Gesture Based Vocalizer". Designing of a jacket, which would be capable of recognizing the gestures and movements of animals. Virtual reality application e.g., replacing the conventional input devices like joy sticks in video games with the data glove

References

[1] Ashish Nikam, Aarti G. Ambedkar, "Sign Language Recognition Using Image Based Hand Gesture Recognition Techniques", IC-GET 2016.

[2] I. Moon, M. Lee, J. Chu, and M. Mun. "Wearable EMG-based HCI for electric-powered wheelchair users with motor disabilities", In Proceedings of the 2005 IEEE International Conference on Robotics and Automationpp.2649-2654. IEEE, 2005.

[3] Lu Liao, Ying Wu, Yi Xiang, Xinping Yan, "Control System of Powered Wheelchairs Based On Tongue Motion Detection", Cognitive Informatics & Cognitive Computing (ICCICC), 2016 IEEE 15th International Conference, Issue: 23 Feb, 2017.

[4] Nikhita Praveen, Naveen Karanthal Megha M S, "Sign Language Interpreter using A Smart Glove", 2014 International conference on Advances in Electronics, Computers and communications(ICAECC), IEEE 2014.

[5] Rajesh Kannan Megalingam, Clarion Chacko, Binu P Kumar, Ashwin G Jacob, Gautham P, "Gesture Controlled Wheel Chair using IR-LED TSOP Pairs along with Collision Avoidance", 2016 International Conference on Robotics and Automation for Humanitarian Applications (RAHA), Issue: 23, May 2017.

[6] Rohit Rastogi, Shashank Mittal, Sajan Aggrawal, "A Novel Approach for Communication among Blind, Deaf and Dump people", 2015 2nd International Conference on Computing for sustainable Global Development, IEEE 2015.

[7] R S. Shaheen & A. Umamakeswari, 2013, "Intelligent Wheelchair for People with Disabilities", International Journal of Engineering and Technology (IJET), 5(1), pp. 391-397.

[8] Shiyam Raghul M, Surendhar K, Suresh N, R. Hemalatha, Sri Ramakrishna Engineering college, Tamil Nadu," Raspberry Pi Based Assistive Device for Deaf, Dumb and Blind People", USRSET 2016.

[9] Shraddha R, Gborpade, Surendra K, waghamare, "Full Duplex Communication System for Deaf and Dump People, "International Journal of Emerging Technology and Advanced Engineering(IJETAE), volume 5, May 2015,

[10] Vignesh S.N, Vivek Kumar. A, Bharathi Kannan.K, "Head Motion Controlled Robotic Wheel Chair", International Journal of Emerging Technology and Innovative Engineering Volume I, Issue 3, March 2015.