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Survey Paper on Raspberry pi based Assistive Device for Communication between Blind, Deaf, and Dumb People

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Abstract - *Nowadays lack of ability to speak, hear, and see is a genuine impairment. Those with these disabilities employ many techniques of communication with others. They are able to communicate in a number of ways, including sign language. Each word in sign language has a set of associated motions that can be utilized to convey a specific message through human body language. The main goal of this design is to convert sign language to voice and display through LCD by understanding human gestures. This is attained using Raspberry pi, camera, speaker, and LCD module. Consider, that a dumb person stands and performs in front of the camera and the system converts the gestures into speech and plays it through the speaker so that the blind can listen to it and the message is visible on the LCD so that the deaf person can see it. As a result, this system helps people with visual impairments and hearing impairments communicate with one another.*

Key Words: *Raspberry pi module, LCD, Sign language, Speaker, Gestures*

I. INTRODUCTION

Approximately 6 percent of the population in the world has a hearing disability. The proportion of this disability is 30 percent among persons over the age of 65 according to WHO figures. Deaf people with total hearing loss frequently use sign language. In this project, a deaf individual can communicate effortlessly using hand gloves that are attached to a flex detector which converts the sign language into speech using a microcontroller, and the text is displayed on an LCD. At present, the main problem faced by these disabled people is the communication part, to channel their thoughts to other people. This system will help these people to overcome this problem by giving them support for communication. Sign language is used by speechless individuals for communication purposes. Sign language transmits messages using symbols, objects, or Gestures. The gesture is a pattern made by the loops and curvatures of the fingers.

Speech is the most effective and meaningful way in which we can share our opinions and feelings. Although, a huge part of the global population suffers from speech disorders. People with vocal disabilities face many difficulties to share their thoughts with other people. This design removes these difficulties and provides a system for communicating their message easily and solely and not just in the presence of a translator.

II. RELATED WORK

1. *A Novel Approach for Communication among Blind, Deaf, and Dumb People*

Rohit Rastogi, Shashank Mittal, and Sajan Agarwal published in 2nd International Conference on "Computing for Sustainable Global Development", 11th – 13th March 2015; IEEE Conference ID: 35071

This paper is going to concentrate on how to invent a new device that is useful for disabled people for communicating effortlessly with other normal people or people of their type. The objective is to develop the technology that can help individuals who are facing difficulty with blindness or deafness or speechlessness. So the Sharojan Bridge is developed and is based on the Wearable Technology in which the gadget can be worn by the person and thus makes the system smoothly movable. Here they used Texas0Instrumentation Circuitry and Arduino Circuit0Board to transmit messages between disabled people.

2. *Communication among the blind, deaf, and dumb People*

B. Buvaneswari, T. Hemalatha, G. Kalaivani, P. Pavithra, A. R. Preethisree published in International Journal of Advanced Engineering, Management and Science (IJAEMS) [Vol-6, Issue-4, Apr-2020] ISSN: 2454-1311

In this project, there are 3 modules: blind module, dumb module, and deaf module. In a blind module, blind people will talk through the mic for communicating with other individuals. In this, they also have an app, in which the blind can do communication with the specific person in their contact by making his own gestures. In a deaf module, anyone can communicate with a deaf person using the terminal. They can write anything and it is shown on the terminal page to others. In a dumb module, sign language is considered a means to communicate.

3. *A Novel Approach to Communication between Blind, Deaf, and Dumb People using flex Sensors and Bluetooth*

Kasi Viswanathan G, Sathya Seelan C, S. Praveen Kumar published in International Journal of Engineering &Technology, 7 (3.12) (2018) 485-490

The blind, deaf, and dumb people lack appropriate communication with others. This system is used to enhance communication between these disabled people. The idea is that the flex sensor and Bluetooth using Arduino Board are used to carry out the communication. Flex detectors are connected to the Arduino board after being mounted with the gloves so that they can bend with the movement of the fingers. The LCD and Speaker modules are attached to the Arduino, which is programmed with the code to display a certain message on the LCD if the sensor is crooked and it gives voice output on the speaker module. The program is written using the Arduino IDE. The message is also transmitted through the app in a smartphone and that is displayed on LCD, it is done by connecting a Bluetooth module to Arduino. GPS0module is utilized to keep track of the present location, which is displayed on the LCD.

4. *IoT-based Assistive Device for Deaf, Dumb and Blind People*

Karmel A, Anushka Sharma, Muktak Pandya, Diksha Garg published in International Conference on Recent Trends in Advanced Computing 2019, ICRTAC 2019

The objective of this paper is to bring a solution that is simple, quick, precise, and economical. The project implements a Google0API and Raspberry Pi-based system for sightless, speechless, and hearing-impaired individuals. This system allows a blind individual to listen to the audio which is a result of Image to text and speech conversion. For a deaf individual, speech is taken as input through the microphone, and it is converted to text that is shown on the pop-up window on the screen of the user. The dumb people are informed to take the input as text through a keyboard that is visible on the screen, then the text is converted into speech, and the result is given through the speaker.

5. *Communication Assistant for Deaf, Dumb and Blind*

Rajyashree, O. Deepak, Naresh Rangaswamy, K.S. Vishal published in International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8, Issue-2S11, September 2019

This paper targets on attaining the smart approach for blind people to listen to the message which is in the form of text and also sense it in braille which is attained by the device and the content is converted, then presented as audio. For those who are deaf, reading text on a screen rather than audio provides a better reading experience. The dumb can communicate with normal people using the device which recognizes sign language and convert it to text that is visible on the screen and also audio through the speaker. This system is developed using Raspberry Pi along with a tiny instrument. This instrument contains a QWERTY console is connected to, on one side is an LCD display, while on the other is a 3-cell braille display. A person with normal vision types something on a QWERTY keyboard. Using their fingertips on the Braille display, a blind person may now read the displayed text. The Braille input keys are used to respond. The message on the LCD may be read by the sighted person.

6. *Indian Sign Language Translator Using Flex Sensor Gloves*

Amit Singh Chouhan published in - IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834, p- ISSN: 2278-8735. Volume 11, Issue 6, Ver. III (Nov.-Dec 2016), PP 12-14 www.iosrjournals.org

This paper explains the conversion of Indian sign language into speech with the help of technology and an embedded0system. Sign language is the means of communication that involves the fingers of hands. Using a flex detector, the captured image is converted to digital data with the help of a comparator circuit and microcontroller. They used the signal processing toolbox in MATLAB and it plays the voice based on the value of the sensor. Flex detector can detect the 26 English alphabets. The gloves are mounted with a flex detector at 3 angles to gather the information from every placement of the finger and hand movement to distinguish each word from a particular sign. This is then passed through the microcontroller to the base station and it produces a voice.

7. *Sign Language Detection for Deaf and Dumb Using Flex Sensors*

Yasmeen Raushan, Abhishek Shirpurkar, Vrushabh Mudholkar, Shamal Walke, Tejas Makde, Pratik Wahane published in - International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 03 | Mar -2017

At present the main problem faced by blind, deaf, and dumb people is, communicating with others, to convey their thoughts and feelings to others. Ordinary individuals can grasp and understand new information, facts and knowledge through day-to-day discussions that are going on around them. People with hearing impairments don't have that comfort with others. Hence people can make use of this instrument for communicating with others without any problem. Flex detector and microcontroller are used for the execution.

8. *Gesture To Speech Conversion using Flex sensors, MPU6050 and Python*

Vaibhav Mehra, Aakash Choudhury, Rishu Ranjan Choubey published in - International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8 Issue-6, August 2019

The main purpose of this paper is to remove or reduce the communication gap between disabled people and normal individuals. The approach mainly concentrates on image processing. The idea is that the wearable glove is used by a speechless individual which captures signs and they are converted into voice and text. This system includes an Arduino board as a microcontroller that is integrated with a flex detector and accelerometer, a gyroscopic0detector for detecting sign languages. For better performance, they have integrated an algorithm for finer illustration of data and to give precise results. Here they have used python language to associate the Arduino board with a microprocessor and then the text is converted into speech. This framework is gauged in association with ASL (American Sign Language).

9. *Smart Glove for Sign Language Translation Using Arduino*

Bijay Sapkota, Mayank K. Gurung, Prabhat Mali, Rabin Gupta published in - 1st KEC Conference Proceedings| Volume I, ISBN 978-9937-0-4872-9 September 27, 2018

Speech is the world's most simple form of communication. While using sign language to communicate makes it more challenging for dumb and deaf individuals to converse. For the average person, it becomes difficult to comprehend. The project "Smart Glove for Sign Language Translation" intends to provide a simple means of communication for dumb and deaf individuals. This project uses a glove with detectors and sensors to identify various sign language gestures. Arduino receives the sensor data, which is then communicated over Bluetooth to an Android phone, where it is used for both sign-to-voice and voice-to-sign language translation Most sign language users in real-life use both hands. As a result, this is a prototype piece that shows how easy it is to communicate with persons who are deaf or hard of hearing.

10. *Sign to Letter Translator System using a Hand Glove*

Hanine El Hayek and Jessica Nacouzi, Abdallah Kassem, Mustapha Hamad, and Sami El-Murr published in - ISBN: 978-1-4799-3166-8 ©2014 IEEE

A sign-to-text translation using hand gloves is done in this paper. People with hearing and speaking impairments use these gloves for communicating with other people. Characters executed by gloved hands are displayed on the LCD as alphabetic characters. This glove can be very helpful, effective, and useful in solving communication problems that occur between people with and without hearing problems. It consists of a flexible detector that captures changes in gestures and a microcontroller that collects and processes the data and sends each character of the result to the LCD. Character-to-character translators aim to facilitate communication between senders and recipients so that the meaning of the message is properly achieved and fully understood.

III. PROPOSED METHODOLOGY

In the block diagram above, the entire system is controlled by an Arm 11 processor, which is mounted on the Raspberry Pi board. The system consists of a Raspberry Pi, a camera, an SD card, and a PC. All components are connected via a USB adapter. The Raspberry Pi is an important element of the processing module. The first shield is detected by the USB camera and performs the preset functions for each sign.

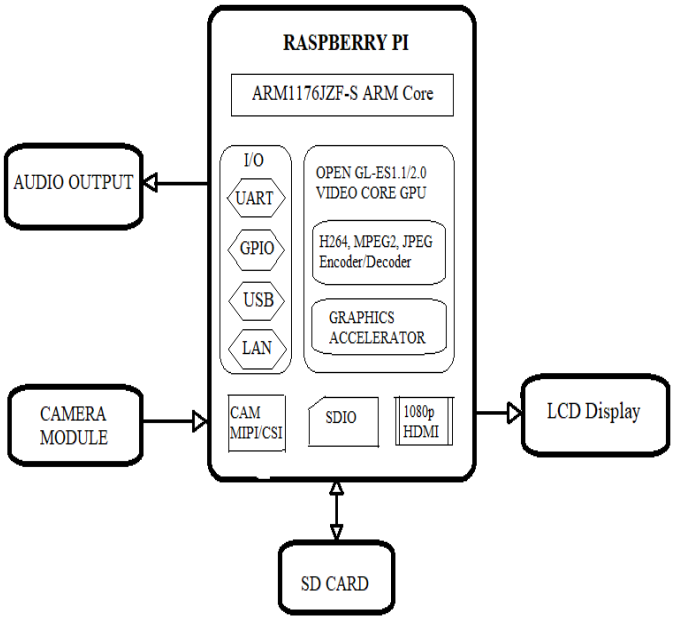

Fig: Flow chart of the proposed methodology

The proposed model is based on a flexible sensor attached to the glove and connected to the Raspberry pi. Extensive research has been invested in the development of gesture-to-speech techniques. Converting gestures into a language can be seen as two approaches. The first method uses flexible sensors and wearable technology, and the second method uses image processing and training algorithms. Using MATLAB, image processing is performed using image segmentation, and using feature extraction algorithms, the system recognizes images of hand gestures captured by the camera and lists pre-recorded tracks. Converts from to voice. The message is: It will be displayed on the LCD.

IV . TOOLS USED

Hardware Requirements:

- Raspberry Pi
- Pi Camera
- SD card
- LCD Display
- Audio Output unit (Speaker)

Software Requirements:

- Program: Python
- Platform: Python 3 IDLE
- Raspberry pi OS: Raspbian OS
- Library: OpenCV

V . CONCLUSION

In this project, we will first bring the hand in front of the camera and then perform the hand gestures in front of the camera. The camera recognizes the gesture and the sound is sent as output from the speaker. The evaluation results show that the proposed system provides very good accuracy and good processing time. However, there are limits to identifying false gestures after collecting results through a complete analysis that takes into account the various parameters or dimensions within the project. As part of our future efforts, we will strive to use techniques related to the identification of counterfeit products and display the results.

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