Smart gloves for the voiceless

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Abstract– People with disability (deaf and dumb) using sign language as a language of expression, But the ordinary people do not understand sign languages. The project help them to enable communication between people and people with disability from using smart gloves.

Keywords— flex sensor, mpu6050, ADC converter, Raspberry pi.

I. INTRODUCTION

Their world could seem silent but it's lively and filled with events. When everything else feels still, the facility of learning and knowledge never ceases to resonate. Many organizations and establishments today became conscious of the importance of supporting the deaf and hearing impaired, and have provided them with opportunities to naturally and simply engage in their community. Communication is that the only thanks to affect people, but the deaf and dumb face difficulty in handling ordinary people. The dumb and deaf people using sign languages that can find difficult to connect with the standard people. They can't understand sign languages, so there's the barrier and gab between the people that disability and therefore the ordinary people. To overcome the matter using the smart gloves to assist them to communication between the people that disability (deaf and dumb) and therefore the ordinary people. The smart glove is an electronic device which may translate the sign hand gestures (sign languages) into text that the traditional person can understand, by which smart glove devour the gesture of hand and translate it into text.

II. LITERATURE REVIEW

In, 2020 Mohamed Abdel-Moniem and Other presented their point generally hearing-impaired people use linguistic communication based on hand gestures with specific movements to represent the ideas to others. The proposed glove is a robotic gadget that interprets Sign Language Standard into text or speech in order to reduce the information transmission gap between deaf-dumb and normal people. This glove has been actualized with the assistance of ex sensors, accelerometer, raspberry and ADC [1], there are some letters that are crossed out, and that's due to the extreme similarity with other letters that our glove could not distinguish between them, and that would confuse the algorithm and not give very accurate results. We had to cross out some letters based on what the most used letters in the language Arabic are, we tried to cross out the less-used letters to make it as convenient as possible for the glove user to express themselves. [7][8][9].

In 2019, Fatima Babiker Ahmed Mohammed presented Design of a Smart Glove for Gestures Conversion into Text and Speech for Disabled Individuals. People with disability (deaf and dumb) using sign language as a language of expression. From using sign language which depend on hand gesture and movement. To overcome the problem using smart glove to enable communication between people and people with disability. The smart glove is an electronic device that converts sign language gesture to text and voice. The glove is design and implemented using ex sensor, MPU 6050 sensor, Micro SD Adapter, Speaker, LCD 16X2 and Arduino Nano [2].

People with disability (deaf and dumb) using sign language as a language of expression. From using sign language which depend on hand gesture and movement. To overcome the problem using smart glove to enable communication between people and people with disability. The smart glove is an electronic device that converts sign language gesture to text and voice. The glove is design and implemented using flex sensor, MPU 6050 sensor, Micro SD Adapter, Speaker, LCD 16X2 and Arduino Nano. The circuit here is include five flex sensors and MPU6050 circuit, using flex sensor to determine the amount of bending of finger and MPU6050 sensor to determine the direction of hand. As example using some gesture represented. The output appears on the LCD some letter such as "A","D" ," G" ," H"[3-6].

III. SYSTEM DESIGN

The project consist of five flex sensor , mpu6050 ,mcp3008 and raspberry pi when the Glove worn by the user which mounted by flex sensors , accelerometer ,raspberry pi , the flex sensors give their output in the form of change in resistance according to the bend angle, the output from the flex sensors is connected to voltage divider circuit then connected to the analog input of raspberry pi .

the accelerometer gives output signals in terms of analog voltages that are proportional to acceleration, the output from the accelerometer is given to analog input of raspberry pi , the gesture is defined from the output of flex sensors and accelerometer and fed to raspberry pi to recognition, raspberry pi compare it with recorded data and when there is conformity with gesture then loaded display the determined text intended by gesture, The block diagram is shown in Fig. 1.

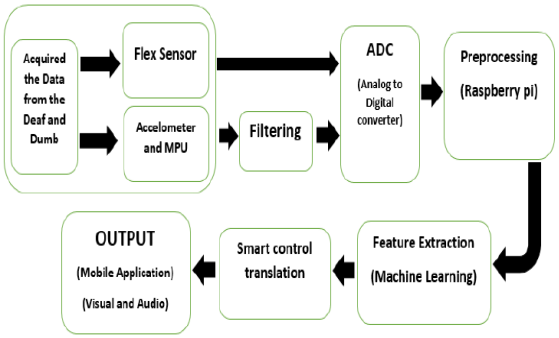

Fig. 1 Block Diagram for the system.

IV. HARDWARE DESIGN

We will use a 20k resistor connected with pin 1 of the flex sensor to achieve a voltage divider between the flex sensor resist or and the 20k resistor. We will use MCP3008 as Analog-Digital-Converter (ADC) to convert output readings from analog to digital due to Serial-Peripheral-Interface (SPI) protocol, The Hardware design wiring is shown in Fig. 2.

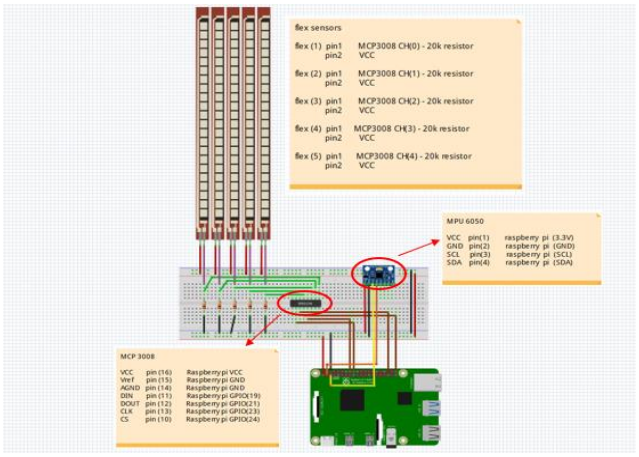

Fig. 2 Hardware Design wiring for the system.

Raspberry pi connections:
Pin 1 (VDD): 3.3V.

- *Pin 6 (GND): GND.*
- *Pin 19 (GPIO): MCP3008 Pin 11 (DIN).*
- *Pin 21 (GPIO): MCP3008 Pin 12 (DOUT).*
- *Pin 23 (GPIO): MCP3008 Pin 13 (CLK).*
- *Pin 24 (GPIO): MCP3008 Pin 10 (CS/SHDN).*

MCP3008 connections:

- *Pin 16 (VDD): VDD.*
- *Pin 15 (VREF): GND.*
- *Pin 14 (AGND): GND.*

Flex sensor connections:

- *Pin 1: MCP3008 Pin 1 (CH0) - 20k resistor.*
- *Pin 2: VDD.*

V. SOFTWARE DESIGN

Fig. 3 Software Block Design for the system.

Data Acquisition:

- *Read Data from the Flex sensors.*
- *Initialize the MCP3008 to convert the Analog to Digital signals.*
- *Read Data from the MPU6050.*

Data Processing:

- *Using Raspberry pi 4 as controller.*
- *Using the Python language for coding.*
- *Feature Extraction .*
- *Machine Learning.*

Output:
Phase 1: Generate character.

- *Using GUI (Tkinter software) for character display.*

Phase2: Word and Animated character.

- *Build a mobile application.*

VI. RESULT

The person who wears the glove , the gesture is consist of direction of hand and bending degree of five finger , which gets for gesture value by detect the hand and bending degree of five finger by MPU6050 and 5-flex sensor respectively, the value of these sensor is fed to ADC of raspberry pi 4, with each variable of value of sensors either bending the finger or change the hand direction the sensors give values for each changes, the gesture then be define as specific values determined for each sensor. When determine gesture was pick up it will be translation into text at GUI, as shown in Fig.4.

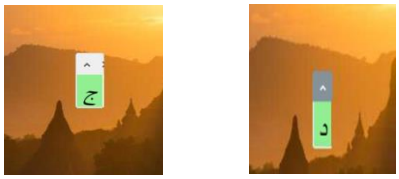

Fig. 4 The character display using (GUI).

CONCLUATION

To sum up the glove is capable of translating their sign language gestures into speech and text, so, that communication is not limited between disable people only they can communicate with normal people to give the voice to the voiceless, and make their future better.

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REFERENCES

[1] Mohammed Abdel-Moniem, “Smart glove graduation project”, graduation project thesis, Akhbar El Youm Academy, 2020.

[2] Fatima Babiker Ahmed Mohammed, “Design of a Smart Glove for Gestures Conversion into Text and Speech for Disabled Individuals”, graduation project thesis, Sudan University of Science and Technology, 2019.

[3] Vishal Nayakwadi and N. B. Pokale, ―Natural Hand Gestures Recognition System for Intelligent HCI: A Survey‖, International Journal of Computer Applications Technology and Research,Vol.3,No.1,pp. 10 – 19, 2014.

[4] K.V Fale, Akshay Phalke, Pratik Chaudhari, Pradeep Jadhav, “Smart Glove: Gesture Vocalizer for Deaf and Dump People”, JSPM‟s Rajarshri Shahu College of Engineering, Pune, India, International Journal of Innovative Research in Computer and Communication Engineering. Vol: 4 Issue: 4, ISSN: 2320-9801, April 2016.

[5] K.C. Sriharipriya, K.Aarthy, T.S.Keerthana, S.Menaga ,S. Monisha, ―Flex Sensor based Non-specific User Hand Gesture Recognition‖, International Journals of Innovative Research and Studies, Vol.2, No.5, pp.214-220, May 2013.

[6] Pallavi Verma. “International Journal of Engineering Research & Technology (IJERT)” Vol. 3 Issue 11, November-2014.

[7] Praveen Kumar, S Havalagi and Shruthi Urf Nivedita, ―The Amazing Gloves that give Voice to the Voiceless‖, International Journal of Advances in Engineering & Technology, Vol. 6, No.1, pp. 471-480, March 2013.

[8] Helen ―Using Multiple Sensors for Mobile Sign Language Recognition‖ Proceedings of the 7th IEEE International Symposium on Wearable Computers IEEE Computer Society Washington, DC, USA 2003.

[9] Praveen Kumar, S Havalagi and Shruthi Urf Nivedita, ―The Amazing Gloves that give Voice to the Voiceless‖, International Journal of Advances in Engineering & Technology, Vol. 6, No.1, pp. 471-480, March 2013.