HAND GESTURE RECOGNITION FOR VOCAL IMPAIRED COMMUNITY

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Abstract:
Hand gestures are one of the most prevalent non-verbal and visual communication methods used by people with speech impairments all around the world. The current issue is that most people are unable to understand hand signals or turn them into spoken language quickly enough for the listener to comprehend. The major goal of this project is to provide a better solution for speech impaired persons by creating a glove that will help to eliminate or at least reduce the communication gap between speech impaired and non-speech impaired people. The Arduino Uno serves as the microcontroller in our prototype, which is connected to flex sensors and an accelerometer. for reading hand gesture, LCD display for displaying text output and a Bluetooth module for generating the voice output in mobile.

KEYWORDS: Hand gestures, Flex sensor, accelerometer, Arduino Uno,Text to speech, Bluetooth

1. Introduction:

It was created in response to the necessity for the development of an electronic device that can translate sign language into voice, allowing silent populations to communicate with the broader public. The data gloves are regular textile driving gloves with flex sensors running the length of each finger. Dumb persons can use the gloves to make hand gestures, which are then translated into speech so that normal people can comprehend them. In sign language, a gesture is a distinct movement of the hands that creates a specific shape. The goal of this project is to break down communication barriers. One of the richest sources of tactile sensory data is the hand, which allows for precise and intricate manipulation. Human robot interaction systems that leverage the hand's sensitive manipulation ability have been actively investigated for rehabilitation, virtual reality, entertainment, tele-operation, power support, and other applications. Measurement of unrestricted hand motion should come first in the development of such devices. Hand motion measuring systems have yet to be completely utilised.

Hearing and speech loss can make people feel alone and lonely, which can negatively impact their social and professional lives. They use sign language to express themselves. Sign language is a well-structured code gesture in which each gesture has a specific meaning. For deaf people, sign language is their only form of communication. Many techniques have been developed as science and technology has progressed, not only to reduce the problem of deaf and dumb people, but also to apply it in various industries. Instead of using voice or sound patterns, sign language relies on physical communication and body language to deliver its meaning. This mostly entails a combination of hand forms, orientation, and movement. Sign Language is used not only by the deaf, but also by those who can hear but cannot speak.

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It will be adaptable to the needs of the average person. Several studies on hand gestures have been conducted; some of the methodologies are discussed in the following section.

Figure 2.1- Block Diagram of Proposed model:

2.2 Block Diagram :

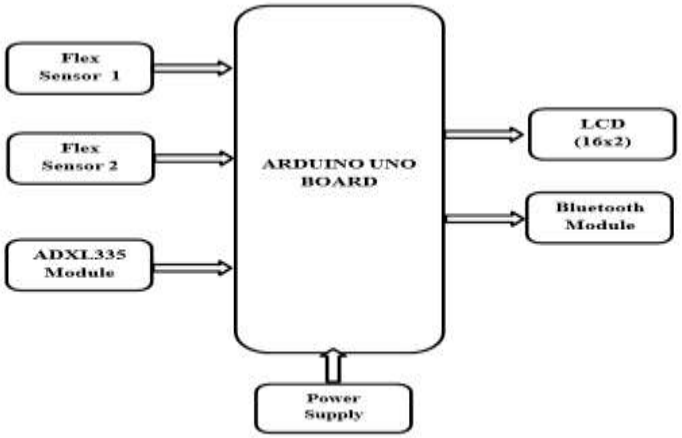

Fig 2.2: Block Diagram

Working:

2.3 **Power Supply:**

This portion is responsible for delivering power to all of the preceding sections. It comprises mostly of a transformer that converts 230V AC to 12V AC, followed by diodes. To correct the AC to DC, diodes are utilised. The resultant The SIGN LANGUAGE RECOGNIZER is depicted in Figure as a block diagram with a power supply, Arduino UNO board, Flex sensors, Bluetooth(HC-05) module, and LCD display attached on the hand glove.

2. 4 Hardware Details:

ARDUINO UNO: The Arduino UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family.

Fig:2.4 **ARDUINO**

FLEX SENSOR It is a kind of sensor which is used to measure the amount of defection otherwise bending. The designing of this sensor can be done by using materials like plastic and carbon. The carbon surface is arranged on a plastic strip as this strip is turned aside then the sensor's resistance will be changed. Thus, it is also named a bend sensor. As its varying resistance can be directly proportional to the quantity of turn thus it can also be employed like a goniometer.

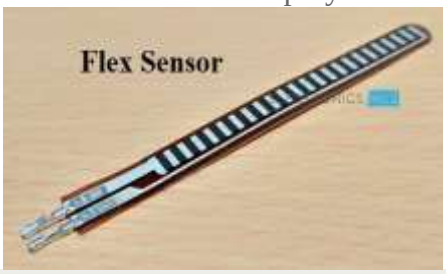

Fig2.5 **Flex Sensor**

- **ADXL335 ACCELEROMETER :** An accelerometer is a tool that measures the vibration, motion, or acceleration of a structure. Cameras and smartphones these days use an accelerometer consisting of an axis-based motion sensor. It is an electromechanical device that measures either static or dynamic acceleration. Acceleration, as we know, is the measure of change in velocity upon a given time.
- Accelerometers are used in the compass app you use on your phone. The motion sensors in accelerometers can detect earthquakes too. Another example is when the accelerometers measure the gravitational pull to determine at which angle is the device being titled.

Fig2.6 **ADXL335** Accelerometer module

Bluetooth Module: We carry a differential range of **Bluetooth** transmitter and Receiver **modules** which can be used for short-distance wireless Audio transmission or you can control.

Fig2.7 **Bluetooth module**

LCD: (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

Fig2.8 Liquid Crystal Display

3 Proposed Model Design and Results and Evolution Metrics:

In this project we proposed a device which is low cost and user friendly designed using Arduino uno with flex sensors and ADXL 335 accelerometer for the sign to text conversion which was implemented for the vocal impaired people. This arrangement is placed on a hand glove which is wearable by the impaired people to communicate with the world as a normal people.

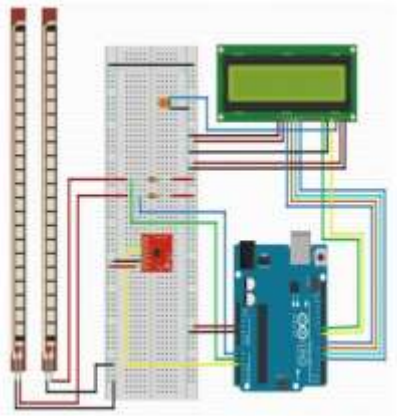

Figure 3.1- Circuit Diagram

Figure:3 .2- final output

3. 3.1.1 ADVANTAGES

- Simple, Low cost and easy to implement
- Easy to operate
- Low power consumption
- Sign language is a neat way to express yourself
- It conveys message very quickly
- Single equipment - Multiple applications
- It's around us all the time
- We can communicate with animals and babies also
- Introduce you to New Culture and Community

3.3.1.2 Applications

- Aid for Disabled and Deaf people
- Sign language analysis, translation
- Sign language teaching
- Computer Interface
- Translation of gestures to commands

Daily Life Applications:

- Used for the blind and speech impaired people to communicate with themselves andwith normal people.
- Can be used as an assistant for physically challenged people

3.4 Implementation Study

- The flex sensors are mounted on the fingers of the hand glove and these are directly connected to the controller.
- The ADXL335 is a 3-axis accelerometer which is also connected directly to the microcontroller.
- The Flex sensor is the variable resistor that can be used to detect the variation in resistance as per the bend in the sensor and Each finger has its own flex sensor.
- When the output of ADXL335 is less than 445, then the microcontroller will notice that the hand was raised.
- The outputs from the flex sensors and the ADXL335 accelerometer are read by microcontroller.
- The microcontroller then converts these into the corresponding output based on the bending of the finger and alignment of them.
- The controller generates the output for the corresponding gesture used by the vocal impaired people.
- The generated output for the corresponding hand gesture is converted into both text and voice outputs.
- The text output will be displayed on the LCD.
- And a BT TTS application is used for the voice output, for this wireless communication device Bluetooth is used for the transmission of the converted output to the mobile to produce

3.5 Conclusion:

As a result, the project "HAND GESTURE RECOGNITION FOR VOCALLY IMPAIRED COMMUNITY" was successfully completed. The power supply, the Flex sensor, the ADXL335 accelerometer, the Bluetooth module, the Arduino Uno board, and the LCD display were all examined. The programme for getting the right output of a hand gesture was programmed into the microcontroller. The text and voice outputs are handled by the LCD and Bluetooth modules. As a result, we conclude that this effort enables speech-impaired people to communicate with the rest of the world, allowing them to express themselves without difficulty.

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