IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 9, June 2022
Impact Factor: 6.252

Voice Assistance for Dumb People Based on Hand Gestures

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Abstract: *It is extremely difficult for people who are deaf to communicate their message to normal people. Communication becomes extremely difficult in case of an emergency, while travelling or among unfamiliar people because most people are not trained in hand sign language. We propose a voice aid system that allows deaf persons to communicate with regular people by using hand motions and gestures. This system uses motion and flex sensors, as well as a speaker unit. The circuitry that runs this system is fuelled by batteries. The system includes various pre-programmed messages such as "need help," "where is the washroom," and other common phrases that enable deaf individuals communicate basic information. The technology analyses a person's hand motions for different variants. It also has a trigger sensor to provide the impression that the person wants to activate the device and say something.*

Keywords: Sign Language, Hand Gestures, Flex sensors, communication.

I. INTRODUCTION

When compared to communication between blind and ancient sighted individuals, the communication between a dumb and hearing person offers a significant disadvantage. While the dumb have their own manual-visual language that they refer to as language, the blind can communicate freely by making references to ancient languages. Deaf communities may be found all throughout the world, and language is another non-verbal means of communication. The gadget that decodes hand signals according to sensitivity is called a dumb communication interpreter. The main aim of this paper is to provide a problem that will effectively transform linguistic gestures into texts and voices of all sensibilities. The interpreter uses a glove-based system that includes flex sensors and resistors. The sensors recognise each hand motion made, and the controller correlates the gesture with pre-stored inputs to generate a symptom. As it is more accurate than a visual-based strategy, we are utilising a device-based approach. Here, the device will be able to talk as well as display in 4-5 Indian languages depending on the language that the average person prefers based on the hand gestures given by the dumb person.

1.2 Problem Statement

There are only 8 saved messages in the current system. Our goal is to create a device that uses the permutations and combinations of four fingers to store as many messages as it can. The current technology can only speak in one language, making it impossible for the average individual to converse with others if they don't understand that language. As a result, the project's primary goal won't be achieved. Our project's primary goal is to develop communication between a dumb person and a normal person by using several languages.

II. LITERATURE SURVEY

[1] This study described how Indonesian sign language may be converted into text using the optical flow method and the Euclidean distance calculation feature by detecting the x and y positions.
[2] This study claimed that the device will help parents of children with various kinds of ailments with their children's speech treatment. The system will make speech, show gestures, and replicate the relative frequency of the alphabets so they may be felt on the user's skin.

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[3] Wearing gloves integrated with resistors and sensors enables deaf and mute persons to execute hand gestures. The device would first convert the gesture into the corresponding text, and then it will use a text-to-speech synthesiser to create the speech for that text.

[4] This paper discusses about various systems built for differently disabled people, system design and applications of this voice assistant.

III. SYSTEM OVERVIEW

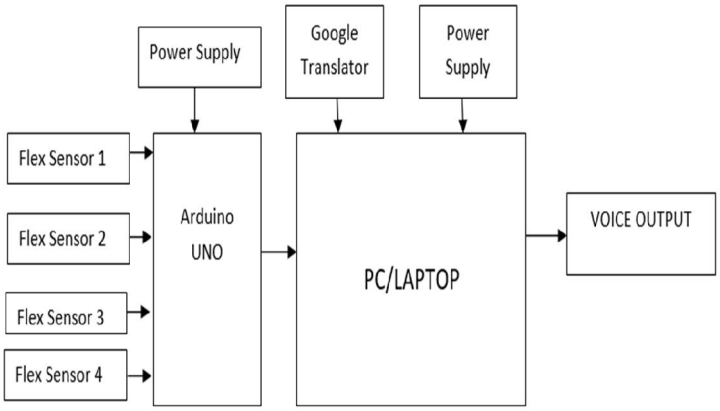

Fig 3.1 Block diagram of proposed system

The system design includes power supply, Arduino UNO board, Flex sensors, Google translator, Resistors and a Speaker.

- **Flex Sensor:** Flex sensor has two terminals that resemble p1 and p2. There are no positive or negative terminals since this sensor lacks any polarised terminals, such as diodes or capacitors. This sensor needs 3.3V to 5V DC to operate, and this voltage may be obtained using any kind of interface. Since the resistance will differ when the surface is level, the resistance change may be dependent on the surface's linearity. The resistance would be different if the sensor were rotated by 450 degrees. The resistance would be different if this sensor were to be turned to 900. The bending conditions for the flex sensor are these three.
- **Arduino Uno:** A variety of expansion boards (shields) and other circuits can be interfaced with the board's sets of digital and analogue input/output (I/O) pins. The board can be easily programmed using the Arduino IDE (Integrated Development Environment) through a type B USB connection. It features 14 digital I/O pins and 6 analogue I/O pins. Although it supports voltages between 7 and 20 volts, it may be powered by a USB connection or an external 9-volt battery.

3.1 Data Glove

Flex sensors and measuring device sensors are the two detectors that make up a data glove. The lean detection module detects the output of the measurement device sensors, whereas the gesture detection module detects the output of the flex sensors and, as a result, the total hand gesture. The voice synthesis module receives an 8-bit address from the gesture detection module that is fully unique for each gesture. To respond to the message it has received, the Speech Synthesis module says it numerous times.

Fig 3.2 Data Glove

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IV. METHODOLOGY

The data glove, which has four Flex sensors on the fingers, is used to determine the position and orientation of the hand while the power is ON. The four fingers' angles when creating a sign can be evaluated using flex sensors. Signals from the sensors are amplified when the user makes a gesture thanks to an individual signal amplification circuit. The vocal output is created based on a language chosen by regular people, while a dumb person communicates through hand gestures.

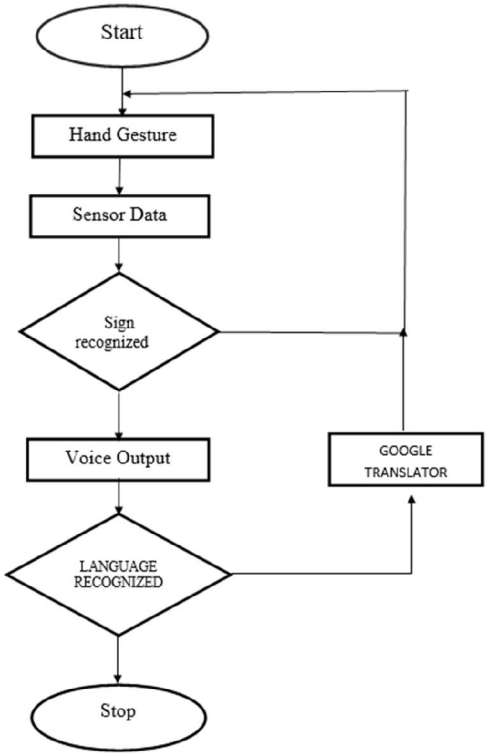

Fig 4.1 System Flow Diagram

4.1 Data Flow

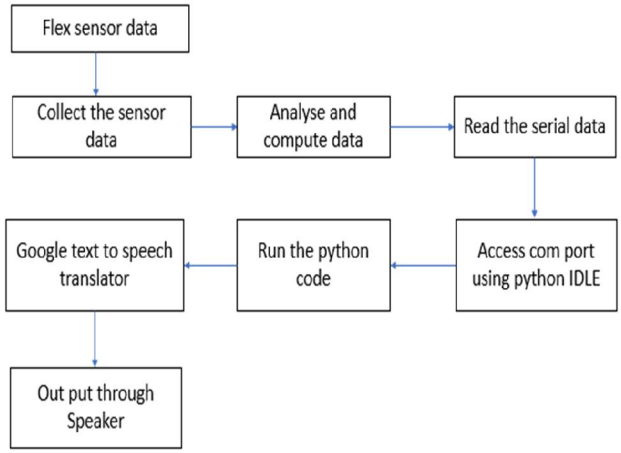

Fig 4.2 Block Diagram of flow of data

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Flex sensors are used to gather, analyse, and calculate the sensor data. The voltage divider technique is used to transform the acquired data into serial data. The desired output is generated when the fingers are bent by gaining access to the comport on the Arduino board using Python IDLE. The voice message is created using Google's text to speech converter.

V. RESULT AND ANALYSIS

```
0
[INFO] Waiting For Gesture

2
[INFO] Playing Audio Please Wait
1
[INFO] Playing Audio Please Wait

0
[INFO] Waiting For Gesture

0
[INFO] Waiting For Gesture

4
[INFO] Playing Audio Please Wait

0
[INFO] Waiting For Gesture

3
[INFO] Playing Audio Please Wait

0
[INFO] Waiting For Gesture

0
[INFO] Waiting For Gesture

0
[INFO] Waiting For Gesture
```

Fig 5.1 Output

As the power supply is delivered to the data glove. The value is first being read. If there is no finger movement, the message "Waiting for gesture" is shown. According to the combination, the appropriate number and the phrase "playing Audio Please wait" are displayed when the finger is bent. It continues to read the sensor data after the audio has finished playing.

VI. FUTURE WORK

The algorithm may also be expanded to a few frequently used sign language terms, eliminating the need to display the whole spelling every time. Instead of purchasing flex sensors, velo stat and conducting wires may be used to make flex sensors that are more efficient. To avoid issues caused by different cables protruding from the smart gloves, some sort of wireless mechanism can be used. By merging LabVIEW software with another processor to make it portable, the project may also be created as a stand-alone device. The memory used by the LabVIEW code may be reduced by optimization, which will speed up processing.

VII. CONCLUSION

The only way the deaf or mute community can communicate and mingle with the general public is through sign language. The goal of this initiative is to close the communication gap that exists between the silent group and the rest of society.

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The proposed approach translates voice into language. The technology gets around dumb people's time constraints and helps them behave better. This technique changes the words into a passing voice that even blind and elderly people may understand. To help deaf persons as well, the language is translated into some type of writing that is presented on a digital screen. For those of us who are deaf or dumb and are unable to converse with older people, this technique is beneficial in real-world settings.

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