

## Assistive Sign Language Interpreter

Rutuja Shelar<sup>1</sup>, Amruta Kulthe<sup>2</sup>, Swaleha Momin<sup>3</sup>

*Electronics & Telecommunication, Dr. D. Y. Patil Institute of Engineering Management & Research,  
Akurdi*

<sup>1</sup>rutujashelar99@gmail.com

<sup>2</sup>swalehamomin6@gmail.com

<sup>3</sup>amrutakulthe82@gmail.com

### **Abstract—**

*The main goal of this project is to create a glove system that can continuously identify sign language gestures and translate that into spoken words. In real time the template database of hand gesture messages are fed into a microcontroller and the magnetometer and flex sensors are fixed in the hand glove. After each movement of fingers the motion sensors get accelerated and give the signal to the microcontroller. The microcontroller compares the action with the database and creates the speech signal. The audio signal is delivered by speaker. This device can also monitor the surrounding temperature and location of that person and send it through WIFI.*

**Keywords—** Accelerometer, FlexSensor, Glove System, LCD Display, Raspberry Pi  
Microcontroller, Speaker, Temperature Sensor.

### I. INTRODUCTION

Communication is fundamental to the existence and survival of humans. Some of us are blessed to speak and communicate with each other while some aren't. Earlier people used to make fun of someone who can't speak. This made them feel inferior. They started communicating by sign language i.e. hand gestures. But to understand sign language it takes time. With growing technology, there were many devices invented. We have proposed a device called Assistive Sign Language Interpreter. This device consists of a glove system that can continuously identify sign language gestures and translate them into spoken words. A database of hand gesture messages is created and fed into a microcontroller and the magnetometer. Flex sensors are fixed in the hand glove. After every movement of fingers the motion sensors get accelerated and give signal to the microcontroller. The microcontroller compares the action with the database and creates a speech signal. The audio signal is delivered by speaker. We can add new gestures into the preset gesture library. This device can also monitor the surrounding temperature and location of that person and send it through WIFI.

### II. IDENTIFIED PROBLEM

Human evolution took place on the core idea of making life easier. Inspired by this thought, we found people with disabilities more important as taking responsibility for. Their disability should not be a barrier for them to not have an easy life. For that we have come up with this project which converts the sign language i.e. gestures into voice signal. It is more like giving voice to the people who can't speak.

### III. PURPOSE AND SCOPE

- i. To provide normal communication ability to deaf and mute people.
- ii. To track the live location of a person to identify the actual location and reach out to them in an emergency.
- iii. To monitor the temperature of the person to track their health status.
- iv. To give artificial mouth to mute people

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#### IV. METHODOLOGY

The smart glove is made up of flex sensors along the length of all fingers. The flex sensor gives output data which changes with a degree of bend. The analog output from the sensors are then given to a microcontroller. It processes the signals and converts analog signals to digital signals. The gesture is recognized and the corresponding text information is identified. There is no limitation for signs; it is a bit hard to build a standard library of signs. The new sign initiated should be supported by the software used in the handglove system. These sensors are attached along the fingers. The movement of fingers produces the output voltage variation which in turn on converting to analog form produces required voice. With this we have measured the surrounding temperature with the help of a temperature sensor. After the fixed interval GPS will continuously trace the person's location and send it through wifi over the server. Using that server platform a family member can monitor all the activity of the person. A glove along with sensors enables deaf, mute or old people to interact with the public in the required sentence which is very much helpful for them.

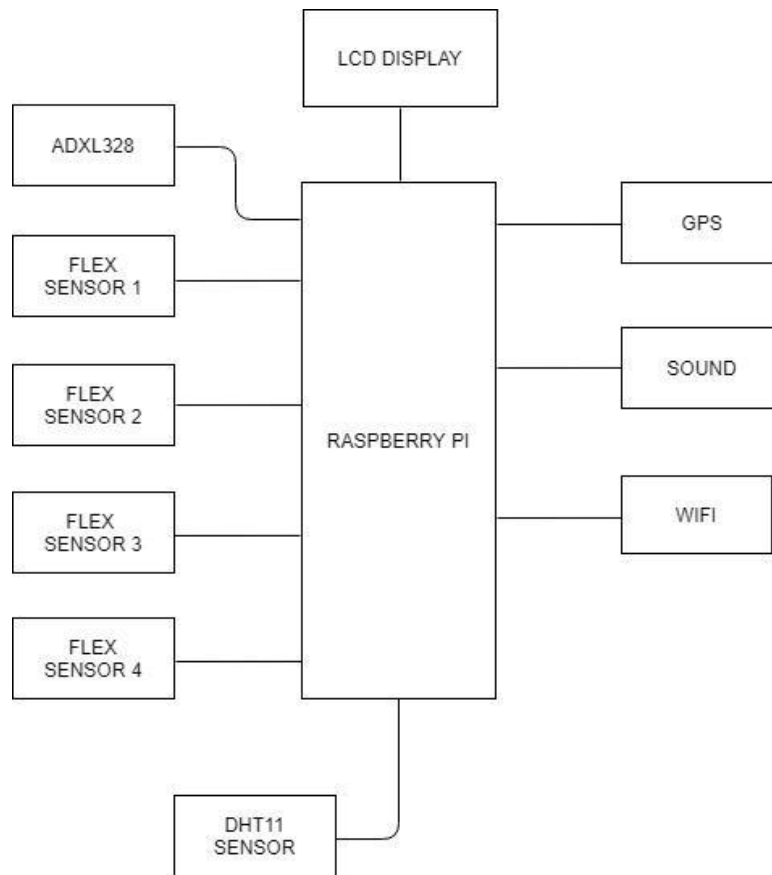


Fig. 1 BLOCK DIAGRAM

## V. FUTURESCOPE

- The specific library of gestures can be prepared to cover all the words so that dumb can speak all the sentences.
- The system can also be designed such that it can translate words from one language to another.
- This area of research remains very active and it is evident that technological advances in computing, sensor devices, materials and processing/classification techniques will make the next generation of glove devices cheaper, more powerful, versatile.
- It's in addition useful for speech impaired and paralysed patient means those do not speak properly and
- in addition used for Intelligent Home Applications and industrial applications.

## VI. WORKING

In this system four flex sensors and one accelerometer sensor which will help us define sign language and convert it into voice signals. Using a temperature sensor we are measuring surrounding

temperature. GPS module is also attached to track the location after a fixed interval and send it through the WIFI server and monitor the activity.

#### A. HARDWARE CONNECTION

The gesture library is dumped into the microcontroller. Analog outputs from the sensors are fed to the microcontroller. The microcontroller processes the signals and performs analog to digital conversion. The gesture is recognized and corresponding information is identified. The output is given to the speaker in analog form. LCD (Liquid Crystal Display) is used to display the output message on LCD and later speech output is given by the speaker. Accelerometer sensor measures the vibration or acceleration of motion of fingers. Along with flex sensors, accelerometer sensors will help us to measure even the vibrations. The benefit of using this sensor is when a person is in danger or panicking then we can get to know them through the vibrations of fingers. Flex sensor is a flexible device which is attached along the length of fingers. It measures the bending movement of the fingers. According to the degree of bend, there is an output of stream data that varies. The output of flex is recognized by the microcontroller and matched with the gestures in the gestures library. DHT11 is a digital sensor for sensing temperature and humidity. This sensor is interfaced with the microcontroller to measure the temperature of the surrounding area. This helps to keep a track on temperature favorable for the person with disabilities. A GPS module is to get track of the location of a person. Using WIFI we can track the location.

#### B. SOFTWARE SPECIFICATIONS

Python Programming:

Python is an interpreted high level and general purpose programming language. Python uses object oriented approach to write clear, logical and dynamic code. Python is dynamically typed and garbage collected. It supports multiple programming paradigms including structured (procedural), object oriented and functional programming. Python is typically described as a “batteries included” language because of its comprehensive standard library.

Python IDE:

IDE stands for integrated development environment. Python is a text editor in which you can write your python coding and run it.

Raspbian OS:

Raspbian may be a free OS supported Debian optimized for the Raspberry Pi hardware. An OS is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides quite a pure OS: it comes with over 35,000 packages, pre-compiled software bundled during a nice format for straightforward installation on your Raspberry Pi. Raspbian OS is one of the official Operating systems available for free of charge to download and use. during this case the Pi. Debian is extremely lightweight and makes a superb choice for the Pi. The Raspbian can be used to browse python programs and GUI desktop.

- Training : This Involves teaching the algorithm what kind of data it should expect. As of now each gesture is associated with a character ( case sensitive ). This means that you can teach the algorithm a maximum of about 60 different gestures.
- Training model code is ready to test on a glove directly.

- Signal code which is used to load, store and process the signals obtained from the accelerometers.
- It provides a method to load the signals from a file and process them.
- Hinder code which is used to load a dictionary and obtain some suggestions regarding the next possible letters or compatible words.



Fig. 2 PROTOTYPE USING THE ABOVE-MENTIONED SYSTEM AND COMPONENTS

## VII. CONCLUSION

Human evolution took place on the core idea of making life easier and better for one's own self and for their fellow humans. Centuries of our history and our ancestors contributed into making our lives easier thus we live an easy life.

Inspired by this thought, it is our core responsibility to make at least one life easier. Considering that, we found people with disabilities more important than taking responsibility for.

Their disability should not be a barrier for them to not have an easy life. We can try making it the utmost easy for them as much as we can with our limitations.

For that we have come up with this system which converts the sign language i.e. gestures into voice signals. It is more like giving voice to the people who can't speak.

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