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## **HAND GESTURE RECOGNITION SYSTEM**

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### **ABSTRACT**

*Speech and gestures are expressions, which are mostly used in communication between human beings Getting the data is the first step. The second step is that recognizing the sign or gesture once it has been captured is much more challenging, especially in a continuous stream. In fact currently, this is the focus of the research. The objective of this paper is to design a simple embedded system based communicating device for deaf and dumb people. In our day to day life most of the task we carryout involves speaking and hearing. The deaf and dumb or paralyzed people have difficulty in communicating with others who cannot understand sign language and miss-interpreters. In this paper, we designed a simple embedded system based device for solving this problem.*

**KEYWORDS** – Node MCU, Sign language, speech, flex sensor, IOT

## I. INTRODUCTION

Here two major problems are taken into consideration. First one is deaf and dumb people communicating with normal person and second one is communication between deaf and dumb people. To solve this problem we have use two modes of operation in this system. We are measuring the actions performed by the deaf and dumb people using resistors array (analog sensor) attached to gloves in a hand of the user. Once the glove is placed in the hands, whenever an action for sign language is performed, the Analog voltage value obtained and the corresponding action is identified by the Arduino uno board. Speaker and BLUETOOTH is used as output device to convey the message from deaf and dumb people to the receiver. Also play-back is used to play the respective sound. Arduino IDE and proteus software tools are used for compiling software coding and simulating the design. This project detects the movements of deaf and dumb or paralyzed patients and plays the stored sound in the play.

## II. RELATED WORK

Komal Vede, Priyanka Vanjare, Pradnya Gaikwad [1] when the glove is placed in the hands, whenever an action for sign language is performed, the analog voltage value obtained and the corresponding action is identified by the arduino uno board. LCD display and BLUETOOTH is used as output device to convey the message from deaf and dumb people to the receiver.

V.Padmanabhan, M.Sornalatha [2] developed a system which is based on the motion sensor. All templates are kept in the database. In the real time the template database is fed into a microcontroller and the motion sensor is fixed in their hand. For every action the motion sensors get accelerated and give the signal to the microcontroller. The microcontroller matches the motion with the database and produces the speech signal. The output of the system is using the speaker. By properly updating the database the dumb will speak like a normal person using the artificial mouth. The system also includes a text to speech conversion (TTS) block that interprets the matched gestures.

Gunasekaran K , Manikandan. R [3] paper mainly addresses to facilitate dumb person's lifestyle. It is difficult to understand the gesture language. To overcome these real time issues, the system is developed. The flex sensors are placed in gloves, which respond to gesture. By using suitable circuit response of the sensor is given to the microcontroller based on the response microcontroller plays the recorded voice using APR9600 using PIC16F877A

Rupesh Prajapati, Vedant Pandey, Nupur Jamindar, Neeraj Yadav, Prof. Neelam Phadnis [4] images are taken from the web camera goes under preprocessing stages to enhance the feature of an image. Then there is a removal of object and background from the images which later convert into binary form. Feature extraction and reorganization helps to match the images that is stored in database and we get the desired output in the form of text and converts that text to speech.

## III. PROPOSED SYSTEM

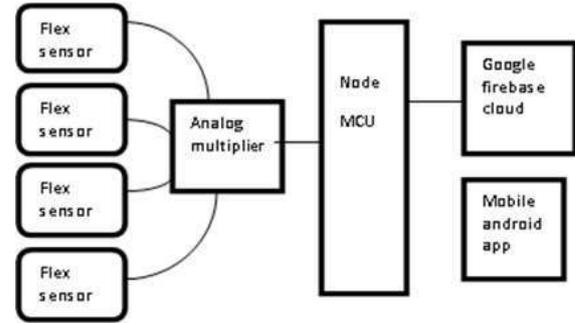


Fig.1 : Block diagram of proposed system

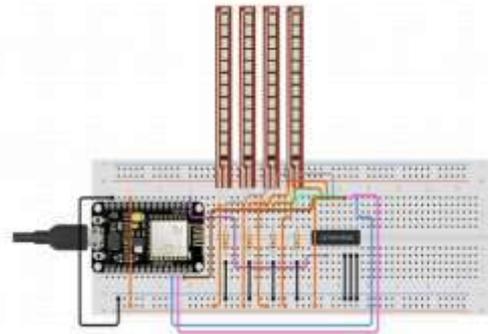


Fig.2: Connection Diagram

Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually, the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to the amount of bend it is used as goniometer, and often called flexible potentiometer

## IV. HARDWARE

### NODE MCU :

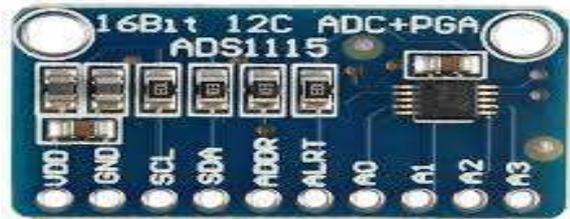
Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Express if Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the elua project, and built on the Express if Non-OS SDK for ESP8266.



Fig. 3: Node MCU

### ADS1115 Module :

This module provides access to the ADS1115 (16-Bit) and ADS1015 (12-Bit) analog-to-digital converters. Other chips from the same family (ADS1113, ADS1114, ADS1013 and ADS1014) are likely to work. Missing hardware features will be silently ignored.



**Fig.4: ADS1115 Module**

This module supports multiple devices connected to I<sup>2</sup>C bus. The devices of different types can be mixed. The addressing of ADS family allows for maximum of 4 devices connected to the same I<sup>2</sup>C bus.

**Flex Sensor :**

A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually, the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface. Since the resistance is directly proportional to the amount of bend it is used as goniometer, and often called flexible potentiometer.



**Fig.5: Flex Sensor**

Types Of Flex Sensor :

1. Conductive ink based flex sensor.
2. Fibre optic flex sensor.
3. Capacitive flex sensor.
4. Velostat flex sensor (popular among hobbyists).

**V. INTERNET OF THINGS**

The Internet of things (IOT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

The definition of the Internet of things has evolved due to convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IOT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers.

The IOT concept has faced prominent criticism, especially in regards to privacy and security concerns related to these devices and their intention of pervasive presence.

**VI. SOFTWARE**

**FIREBASE:** Firebase is a [mobile](#) and [web application](#) development platform . Firebase Analytics is a cost-free app measurement solution that provides insight into app usage . Firebase provides a realtime database and backend as a service

**Steps To Create A Database**

- Step 1 : Goto firebase
- Step 2 : Sign in with your credential
- Step 3 : Click on add project give a project name and click on accept then create project
- Step 4 : After creating project
- Step 5 : Click on database on left side then scroll down and click on creat database in realtime database
- Step 6 : Copy that host name and past in Arduino code given below at line `#define FIREBASE_HOST "demo123-61f7a.firebaseio.com"`

**Step 7: Add Database Secrete Key to Arduino Sketch**

Go to **Setting>Project Setting>SERVICE ACCOUNTS>DATABASE Secretes**. Copy "Database Secrets" Shown in above image. Copy and paste Database Secrets at the line in code `#define FIREBASE_AUTH "examplesd2asdadasdasd2asd3asd2asd2as32das3d2as2da3"`

Step 8 : Change line with your WiFi router name and password

```
#define WIFI_SSID "Wifi Router Name"
#define WIFI_PASSWORD "Router Password"
```

Then upload the code

Again open realtime database there you will see the output

**Programming Language**

**C++ :** C++ is a general-purpose object-oriented programming (OOP) language, developed by Bjarne Stroustrup, and is an extension of the C language. The main highlight of C++ is a collection of predefined classes, which are data types that can be instantiated multiple times. The language also facilitates declaration of user-defined classes. Classes can further accommodate member functions to implement specific functionality. Multiple objects of a particular class can be defined to implement the functions within the class.

**VII APPLICATIONS**

Flex sensor is used in wide areas of research from computer interfaces, rehabilitation, security systems and even music interfaces. It is also famous among students and Hobbyists

## VIII. CONCLUSION

The Proposed Gesture Recognition system converts sign language to speech with the help of flex sensor. This system also aims at integrating the results of the sensors with a smart phone that map the sensor reading to a corresponding sign which is stored in a data base . The output is the form of speech which can be understood by others. This system is autonomous, user friendly & completely mobile system.

## IX. FUTURE SCOPE

The application produced is specifically for deaf and dumb people but this can be used by anyone. We would like to extend applications of these gloves in the field of Education by making the gesture Recognizable under Virtual Reality. The Gloves can also be used for interacting with set of Electronic devices across house using centralized IOT Hub. We also believe that by introducing the concept of machine learning we can teach the gloves to understand the gesture

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