

# Arduino Based Gestures to Speech Converter Gloves for Deaf and Dumb People

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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 paralyze 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. A brief description about various gestures and the implementation part is discussed in this paper. The glove is internally equipped with flex sensors (2). Two Flex sensors resistance changes according to the flexion Experienced. For every specific gesture, the flex detector produces a proportional amendment in resistance and measures the orientation of hand. These each gestures having some different indication of signals which appeared as in the form of output. The process of those hand gestures is finished in controller (Arduino). Using this device deaf-mute and a standard person can be able to communicate with each others in an affordable and convenient way.*

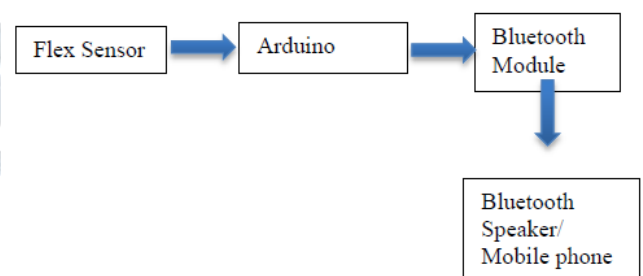
**Index Terms:** *Arduino, Bluetooth, Flex sensor etc.*

## I. INTRODUCTION

Loss of hearing and speech can cause people to become isolated and lonely, having worse affect on both their social and working life. Looking up the meaning of a sign is not a straightforward task. Sign Language is a well structured code gesture where every gesture has a meaning assigned to it. Sign Language is the only means of communication for deaf people. With advancement of science and technology many techniques have been developed not only to minimize the problem of deaf and dumb people but also to implement it in different fields.

Sign language is a language which instead of voice or sound patterns uses manual communication and body language to convey the meaning. This involves mostly the combination of shapes, orientation and movement of the hands. Sign language is not only used by deaf but also who can hear, but cannot physically speak. All India Federation of the Deaf estimates around 4 million deaf people and more than 10 million people have hearing problem in India. The development of the most popular devices for hand movement acquisition, glove-based systems started about 30 years ago and continues to engage a growing number of researchers. Communication involves the exchange of information, and this can only occur effectively if all participants use a common language. Sign language is the language used by deaf and mute people that uses gestures instead of sound to convey or to express fluidly a speaker's thoughts. A gesture in a sign language is a particular movement of the hands with a specific shape made out of them. The main aim of this paper is to present a system that can efficiently translate Sign Language gestures to auditory voice. Several languages are being spoken all around the world. So this system aims to give the voice output in various regional languages.

Gesture to Speech Conversion [1-5] is a tool for converting gestures of the differently abled people of the world to speech i.e. converting gestures input to speech output. Gesture to Speech Conversion [1-5] is a tool for converting gestures of the differently abled people of the world to speech i.e. convert gestures input to speech output. Proposed system is portable and focuses on two way communication. Main goal of the system is to convert hand gestures to auditory speech for communication between mute and normal people.



**Fig. 1: Block Diagram**

There are 2 flex sensors that are used. Each flex sensor is connected to different pins of Arduino UNO which is the controlling unit. Now the Tx and Rx pins of Arduino are connected to Rx and Tx pins of the Bluetooth module HC05 respectively. Now, the Bluetooth module is connected to a Bluetooth speaker of an app in mobile phone to give a speech output.

## II. EXISTING SYSTEM

In the image processing technique camera is used to capture the image/video, with the static images are analyzed and recognition of the image carried out using algorithms that produce sentences in the display. Algorithm

use to extract the image and eliminate the unwanted background noise. The disadvantage of vision based techniques includes complex algorithms for data processing and includes variant lighting conditions, backgrounds and field of view constraints. So Our Approach is Using microcontroller (Arduino) and sensor based data glove to communicate each other.

### III. PROPOSED SYSTEM

In the proposed system, The approach is used with microcontroller (Arduino) and sensor based data glove. The Apr33a3 voice module is used to record the voice of the user. The glove is internally equipped with flex sensors. For every specific gesture, the flex detector produces a proportional modification in resistance and measures the orientation of hand. The process of those hand gestures is finished in controller. The gestures made are compared within database and output is generated in the form of voice audio.

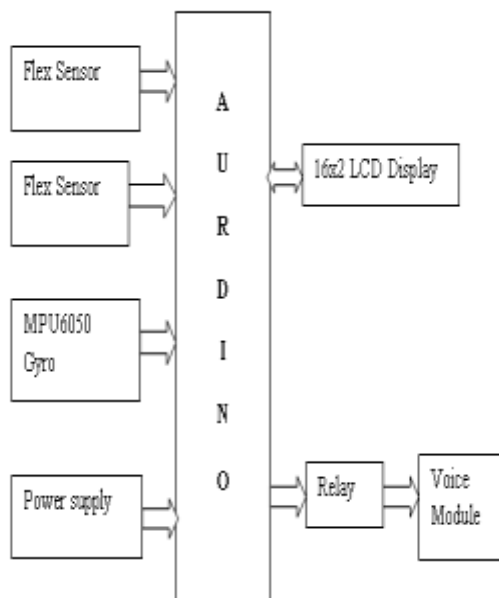


Fig. 2. Architecture of the proposed system

#### A. Working of device :

The user wears a glove that has flex sensors on it. Now when the user wants to say something, he/she makes gestures by bending the fingers. So, different combinations are made with the bending of the flex sensors creating different resistance combinations for the output pin of the Arduino to exhibit different entity. Arduino is connected to Bluetooth module HC - 05; which is further connected to Bluetooth speaker/mobile phone. The flex sensor will give input to Arduino with the bending of the fingers of the person resulting in the change of the angles of the flex sensor hence changing the resistance will trigger the Arduino to give the relevant output as per the code we have written i.e. which combination of resistances will give which entity as my output. Further, when I will have the

output, the speaker which is connected to the Bluetooth module will give the speech signal as my output.

### B. Hardware Components

#### 1) Arduino

Arduino is an open-source microcontroller board based on ATmega 328P. It has 16 MHz clock, 14 pins for an input/output purpose, USB connection, reset button and power jack. It contains everything which is required to implement or design the microcontroller based embedded system applications. In order to process the analog data given by analog sensors it also contains 10 bit ADC (Analog to Digital converter). Moreover, Arduino has inbuilt libraries for almost every application.



Fig.3 Arduino Micro Controller

## 2) Flex Sensor



**Fig 4. Flex Sensor**

The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius—the smaller the radius, the higher the resistance value. A wired glove is a glove-like input device for human-computer interaction, often in virtual reality environments. Various sensor technologies are used to capture physical data such as bending of fingers. Often a motion tracker, such as a magnetic tracking device or inertial tracking device, is attached to capture the global position/rotation data of the glove. These movements are then interpreted by the software that accompanies the glove, so any one movement can mean any number of things. Gestures can then be categorized into useful information, such as to recognize Sign Language or other symbolic functions.

### *Working of flex sensor:*

Flex sensor are sensors that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to electrical resistance the more bend the more the resistance value. They are usually in the form of a thin strip from 1"-5" long that vary in resistance. They can be made uni-directional and bi-directional.

### 3. MPU6050 Gyro Sensor

MPU6050 sensor module is complete 6-axis Motion Tracking Device. It combines 3-axis Gyroscope, 3-axis Accelerometer and Digital Motion Processor all in small package. Also, it has additional feature of on-chip Temperature sensor. It has I2C bus interface to communicate with the microcontrollers. It has Auxiliary I2C bus to communicate with other sensor devices like 3-axis Magnetometer, Pressure sensor etc. If 3-axis Magnetometer is connected to auxiliary I2C bus, then MPU6050 can provide complete 9-axis Motion Fusion output.



**Fig.5: Gyro Sensor**

## IV. EXPERIMENTAL RESULTS

### V. CONCLUSION

Using this glove i.e. which can give a speech output from gestures input will help a lot of people communicating at public places which was a bit difficult earlier for differently abled people like if we say if they required to buy a coffee and for this they had to make the vendor understand via their gestures what they actually want; was a very difficult and time consuming task which will be easily sorted if that person is using this device while asking for a coffee now because with the possession of this glove, his or her gestures will now be converted to speech and the vendor will come to know that the customer is asking for a coffee and so on for other commodities as well..

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