

# DEVELOPMENT OF DEVICE FOR THE MUTE COMMUNITY TO CONVERT THEIR GESTURE SIGNS TO SPEECH

Mr.S.Karthik, M.E.,

Assistant Professor,  
Department of Electronics & Communication  
Engineering  
SSMIET, Dindigul, Tamilnadu.

Siddharth.S,Vasanth Kanna.S

Thoufeek Ahamed.N,Vinoth.V

UG Students,  
Department of Electronics & Communication  
Engineering  
SSMIET, Dindigul, Tamilnadu.

**Abstract** - The mute community around the globe has a hard time communicating with the rest of the world's population. This communication gap is there because a dumb person uses sign language which is not comprehensible by a normal person. This project mainly focuses on removing the barrier of communication between the mute community and the people not familiar with the concept of sign language so that the messages that a dumb person is trying to relay is understandable to a person with no knowledge of sign language. The design of the device is based on embedded systems. Flex sensors and microcontroller are the key components. **Keywords**—Flex Sensors, Arduino, Android Phone, Bluetooth, 2 axis accelerometer, Mobile App.

## I. INTRODUCTION

Technology is developing day by day but no significant developments are under taken for the mute people. Mute people have no ability to interact with their environment. Such people depends on the sign language to access. So importance of hand gesture recognition increases. It creates the natural interaction between them and normal human. According to the statistics of the world federation of the dumb and the world health organization, approximately 70 million people in the world are the mute community. The majority of the speech and hearing, impaired people cannot read or write in regular language. Sign language is the native language use by the mute people to communicate with others. Natural input device like these attract more attention because it is powerful, more effective, and does not require extra connection, than any other devices. Hand gesture recognition is used in TV controlling, robot control, human computer interaction, education, daily information retrieval etc.. This device is developed to improve the life style of the person who has speaking disabilities. This device converts the gestures to speech i.e,gives voice to the mute person. Speech is one of the important factor required for the humans to convey their messages. In this project, flex sensors plays the major role. They are stitched to the glove. The output from the flex sensors is fed into the arduino development board. Arduino converts analog signal to digital and then data is send to android phone via Bluetooth where the speech output is obtained using an android phone. The purpose of this paper is to present a survey on different hand gesture recognition approaches with advantages, disadvantages and recognition methodology of hand gesture recognition. Although a lot of work has been done on hand gesture recognition and recognition methodology, this paper focuses

on advancement of gesture recognition system. It is up to date and represents a good point for investigators in hand gesture recognition area.

## II. LITERATURE SURVEY

### A. Blind Separation of Doppler Human Gesture

*Based on Continuous-Wave Radar Sensors [1].*

Zhitao Gu, Jun Wang, Fazhong Shen & Kuiwen Xu represents a set of experiments used to develop a statistical system from translating speech into sign language for deaf and dumb people. Two different approaches have been used to perform the translations. A phrase- based system and a finite state transducer. The system which is composed of an Automatic Speech Recognition (ASR) system. This paper presents translation results of reference sentences and sentences from automatic speech recognizer. In this experiment, Radar system is used. It creates a problems like high power consumption in this system. In order to overcome the problems, we can modify that power consumption is lower than their radar system.

### B. A Framework for Hand Gesture Recognition & Spotting Using Substrate Modeling [2].

Dinesh mandalpuet al propose a new sub-gesture modelling approach which represents each gesture as a sequence of fixed sub-gestures(a group of consecutive frames with locally coherent context) and provides a robust modelling of the visual features. We further extend this approach to the task of gesture spotting where the gesture boundaries are identified using a filler model and gesture completion model. Experimental results show that the proposed method outperforms state-of-the-art Hidden Conditional Random Fields (HCRF) based methods and baseline gesture spotting techniques.

### C. Hand Gesture Recognition Using Deep Learning[3].

Static and eight dynamic hand gestures. The three main steps are hand shape recognition, tracing of detected hand (if dynamic), and converting the data into the required command. Experiments show 93.09% accuracy HyunChal

Shin propose a technique which commands computer using six y.

#### D. Finger Tip Detection & Hand Gesture Recognition Based on Discrete Curve Evolution With Kinect Sensor[4].

Wu Xia et al propose a novel method that can detect fingertips as well as recognize hand gestures. Firstly, we collect the hand curves with a Kinect sensor. Secondly, we detect fingertips based on the discrete curve evolution. Thirdly, we recognize hand gestures using evolved curves partitioned at the detected fingertips. Experimental results show that our method performs well in both fingertips detection and hand gesture recognition.

### III. METHODOLOGY

The system has both hardware and software. Hardware part includes Flex sensors, Arduino, Bluetooth module, Mobile app, Android phone. Software includes the programming for android phone application and sketch for Arduino. The proposed system is divided into 3 parts.

1. Sensing the gestures
2. Processing of the input
3. Communication

**Sensing the gestures:** Flex sensors for each finger will be stitched to the gloves and are connected to Arduino NANO R3. Based on the bent, the analog output value increases. Arduino converts the analog signal into digital form and hence, generates distinct sensor values for the bends.

**Two axis accelerometer [5]** is also used to sense the gestures. Accelerometers are devices that sense the forces of acceleration. Forces include gravity, vibrations and movement. Capacitance of the accelerometer varies as the suspended mass in accelerometer moves.

**Processing of the input:** Flex sensors outputs are analog in nature. Arduino converts these analog signals to digital and generates sensor values. Same goes for the accelerometer. A sketch is written in Arduino software using the sensor values to assign characters so that when a person shows a specific gesture, a specific character is obtained.

**Communication:** The output from the Arduino is sent to Bluetooth Module and Mobile. Mobile displays the character that was assigned to the gesture in the database. The data is transferred via Bluetooth module to the android phone. The app to convert text to speech is made using MIT app inventor. Hence the audio output is obtained when the Bluetooth transmits the data.

### IV. BLOCK DIAGRAM

Block diagram consist of an accelerometer, flex sensor, arduino , NANO R3 , Mobile Phone, Bluetooth Module HC05 and Power Supply of 5v, 1A.

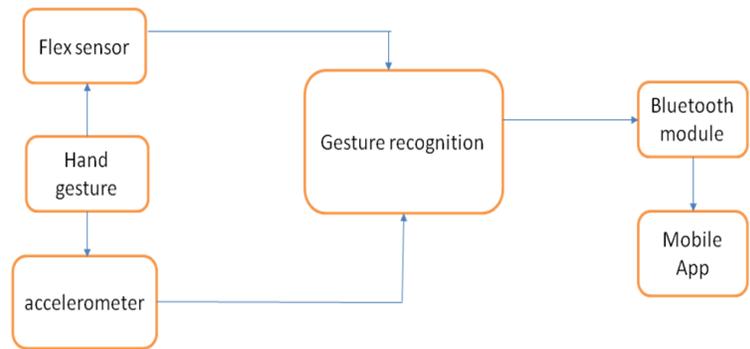


Fig. 1. Block Diagram

#### Power Supply

The power supply of 5V,1A is required for the Arduino NANO R3 and the Flex SensZors. The Power Supply from the mains is 230V,5A so, the power is reduced to 5v by using filters, regulators, capacitors, resistor and a bridge rectifier.

#### Flex Sensors

Flex sensors are stitched to a glove. The dumb person usually uses his or her hands to show signs for communicating. The resistance of the flex sensors increases as the bend increase. So, when the gesture is performed, based on the value of the sensor output is obtained.

#### 2 axis accelerometer

It is an instrument for measuring the acceleration of a moving or vibrating body. It gives different values for acceleration in any of the two axis directions. Accelerometer is fixed on the wrist to detect the acceleration when the wrist is rotated in any of the 2 axis, X axis, Y axis.

#### Arduino NANO R3

The Arduino NANO R3 is a microcontroller board based on the ATmega328. It has 14 digital I/O pins, 8 analog inputs, 4 UARTs, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The analog input from flex sensor is given to arduino to convert it into a digital form.

#### Android Phone

This gives the speech output from the arduino. MIT app inventor is used to make an app that gives the speech output.

#### Bluetooth Module HC05

Bluetooth is a wireless technology standard for exchanging data over distances approximately 10 meters. HC-05 module is an easy to use Bluetooth Serial Port Protocol module. They use short-wavelength radio waves of frequency 2.4 GHz. This is used to send data from the arduino to the Android Phone.

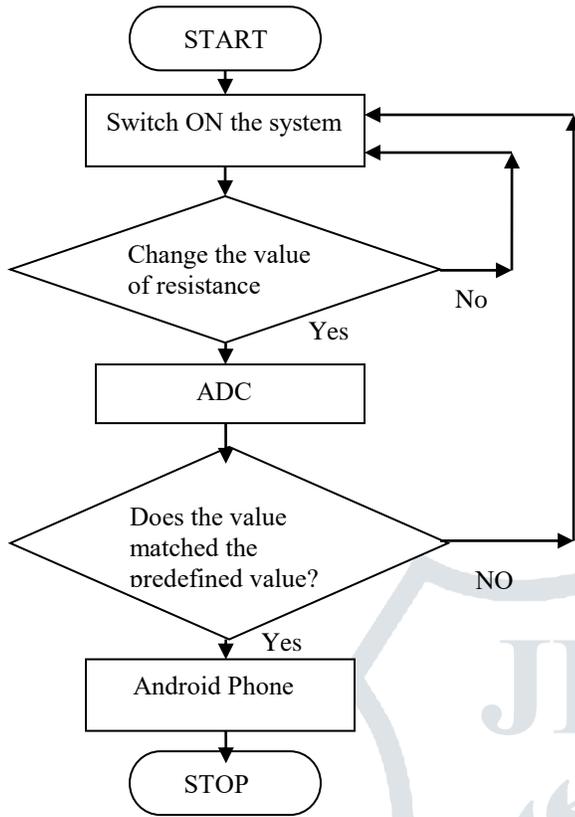


Fig. 2.Flowchart

V. RESULTS

Initially Arduino Software was used to detect the sensor value for each and every bent of the flex sensor. These values are then obtained for the bent of each sensor. These values are then stored in the database.



Fig. 3. Flex sensor Implemented on fingers.

In the Fig.4 the finger having the 1st sensor is kept straight holding the sensor value ranging from 380 to 400. This gives the output in the LCD display as ‘A’.

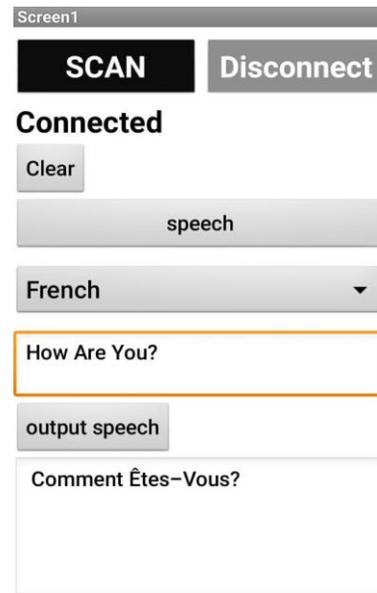


Fig .4. When index finger is bend,output is How Are You?

VI. CONCLUSION

The lifestyle of the mute can also be improved by providing them a means to have a voice for communication even without having a voice. Overall System is effective and efficient because of the use of Arduino microcontroller and android phone and android applications.

The future work is described as follows:

- The device will be portable by using a battery.
- By introducing different languages flexibility is obtained.
- A total of ten flex sensors can be used to increase the precision of this system.

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