

# **SIGN TO SPEECH**

**ITSP TEAM – SRS**

**ITSP TEAM ID – 100**

**We aim to create gloves that can recognize hand gestures that correspond to words and phrases and with the help of arduino translates these signs into speech.**

**These gloves would be lightweight, compact and worn on the hands, but ergonomic enough to use as an everyday accessory, similar to hearing aids or contact lenses .**

## **Motivation for Project**

**They would provide an easy-to-use bridge between native speakers of sign language and the rest of the world.**

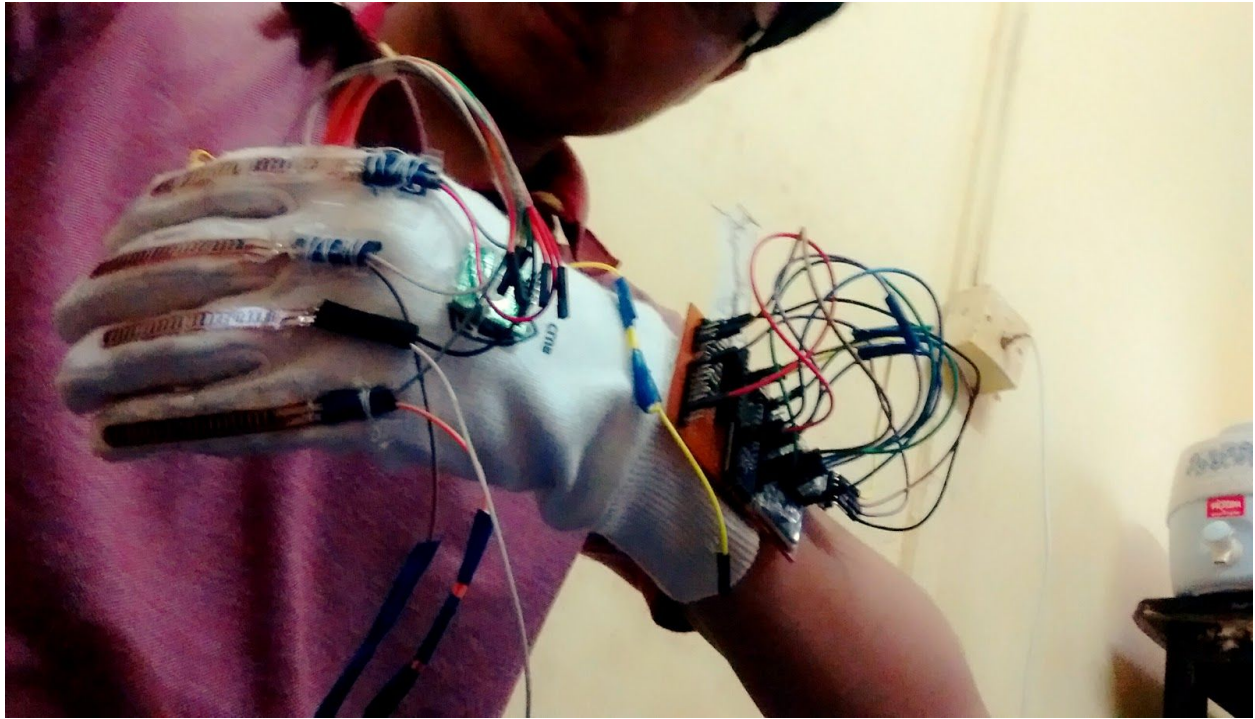
# **Basic Working of Project**

We have used flex sensors (1 for each finger) to detect the flexing of fingers and MPU6050 sensor to detect the acceleration of hand and its orientation.

A bluetooth module was required for sending and receiving data onto the android device . The name of the new gesture added by user is sent to arduino using the app via bluetooth and while reading for gestures what sound is to be played is sent back .

We made a multiple activity application to change modes between read and calibrate .

All these things are integrated on the gloves in order to read users hand action and movement and give optimum results.



## **Components**

**Arduino Nano**

**Arduino Uno(for Initial testing)**

**5 Flex Sensors**

**5- 12 ohm Resistors**

**ADXL335 Accelerometer**

**Bluetooth Module(HC-05)**

**MPU6050-Gyroscope+Accelerometer**

**2-10uF Capacitor**

**Bread Board**

**P.C.B**

**Gloves**

**Jumper Wires**

**SD Card Shield**

**SD Card**

**8 Ohm Speaker**

**4051 MUX - LM386**

# **Plan Of Action :**

**(27<sup>th</sup> May-2<sup>nd</sup> June):**

1. Buying of components-accelerometer .
2. Discussion of how we are going to do the project.
3. Buying of gloves.
4. Did Brainstorming.

**(3<sup>rd</sup> -9<sup>th</sup> June):**

1. Taking flex sensors readings, accelerometer and gyro-sensors readings.
2. Sticking sensors on gloves and calibrating them properly.
3. Documentation of sensors values and various hand movements (their corresponding sensors values)

## **(10<sup>th</sup> -19<sup>th</sup> June):**

- 1.Working on arduino code for playing the audio using sd-card shield, amplifier and completing the structure of gloves.**
- 2.Testing it and further debugging if required.**
- 3.Coding for the words to be spoken using signs and adding their audio to sd-card.**

## **(20<sup>th</sup>-30<sup>th</sup> June)**

- 1.Working on arduino code so that user can add their own gestures .**
  - 2.Making an app for playing the sounds and the user interface for adding gestures.**
- Removing the sd-card shield and speakers from our project.**
- 4.Adding bluetooth module and bluetooth connectivity of arduino to android devices.**

# Problems that we Faced with their Solutions

1.Adjusting the flex sensors and keeping it fixed(for taking accurate data) was one of the major problem.

**Sol:-**We stitched the flex sensors with the gloves and applied tapes to keep it fix.

2.Keeping the accelerometer(ADXL 335)fixed at its position since it was always distorted by the movement of the hand and hence the values were varying considerably.

**Sol:-**For this too we found stitching was a good solution.

3.Arduino Nano(which we have used in our hand gloves) has a very short cable for connecting it to laptop(for uploading the code) which was providing hinder to the movement of the hand.

**Sol:-**To read data from the sensors without the hindering motion of hands,we used app and transferred data of sensors from bluetooth module to the app and in this way we calibrated our movements(data).

**4.**Coming to the App that we made,one of the major problem that we faced was the app getting crashed and sometimes it became very difficult to debug it and figuring out what actually the error was.

**Sol:-**Simple solution -Keep debugging until u find the bug.

## **5.Amplifier Circuit-**

Initially we were planning to produce the sound via a speaker but for that we needed an amplifier circuit so that a normal person at a distance can hear the sound.But eventually we tried (4 to 5 times)but were not able to amplify the sound.Finally we had to think of an alternate way to produce the sound.

**Sol:-**Eventually we included the sound part in the app since it was simply a waste of time on further debugging an amplifier circuit.

## **Application User Interface :**



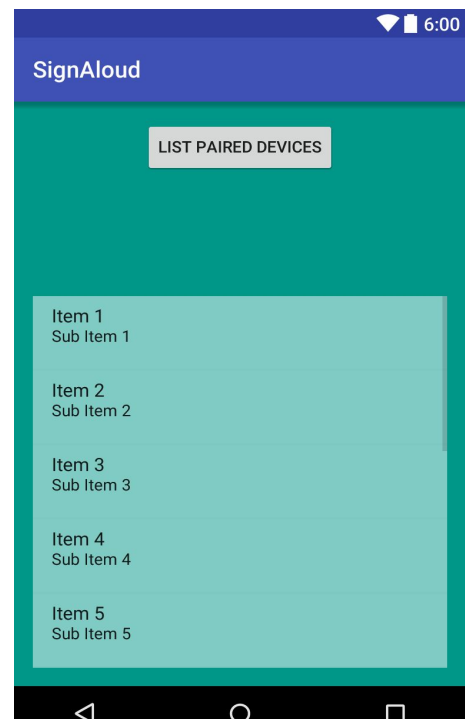
**The application user interface is made intuitive and easy to use so that anyone can easily use the app.**

**Screenshots of various activities of app and their use have been listed below :**

### **List of Paired Devices Interface:**

**Lists all the bluetooth devices which are paired already to your device from which we can connect to any arduino device with bluetooth module.**

**When we click on any item in the list android device gets connected and the activity shown below becomes visible if the connection is a success.**



## Send & Calibrate Interface :

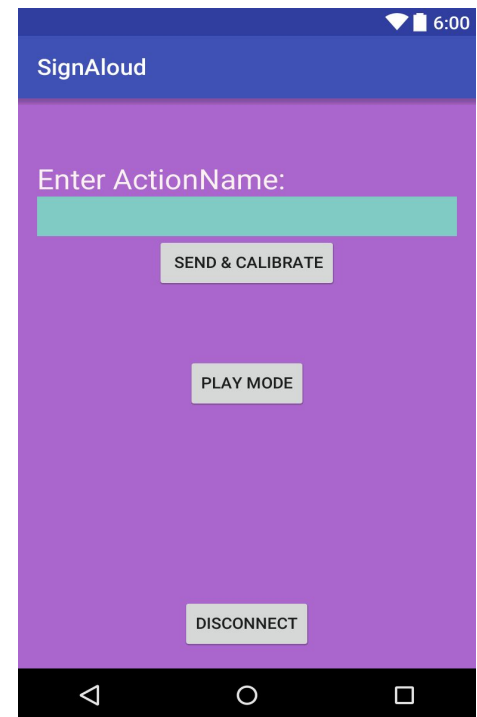
Sends the word to be associated to the new action to arduino .

## Play Mode :

Takes to the activity shown below .

## Disconnect:

Disconnects the connected bluetooth device from the App.



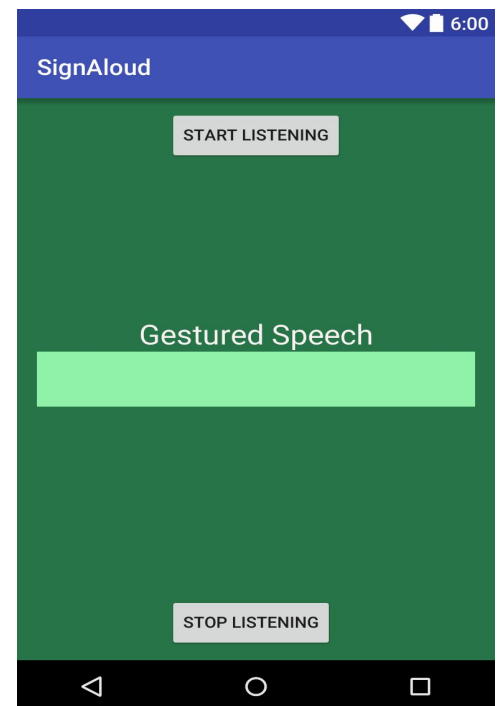
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## Start Listening :

Starts the listening of the gestures and giving audio output .

## Stop Listening:

Stops the listening of the gestures.



## REFERENCES :

For completion of our project we are thankful to the **Managers of Electronics Club, Robotics Clubs** as well as to the **Tinkerers' Laboratory**, the place which allowed us to do all the tinkering stuffs and provided us with most of the basic resources. Apart from that we would also like to thank **WEL Lab** from where we got some of the basic electronics equipments. Finally a heartiest thanks to **TEAM STAB** for organizing ITSP and making our first summer in the Insti a memorable and technical one.

**We also referred to following references :**

<https://github.com/maniacbug/StandardCplusplus> -

Standard c++ library for arduino

<http://playground.arduino.cc/Code/DatabaseLibrary> -

Making database in the memory of arduino

<https://www.arduino.cc/en/Tutorial/EEPROMClear> -

Arduino EEPROM details:-

<http://forum.arduino.cc/index.php?topic=44260.0> -

To run multiple sketches in a program:-

<http://playground.arduino.cc/Interfacing/Java> -

Java interface with arduino:-

<http://playground.arduino.cc/Main/InterfacingWithSoftware>

- Interface of arduino with other softwares

<https://www.arduino.cc/en/Tutorial/Calibration> -

Calibration of sensor Readings with a program in arduino using min max

<https://www.pantechsolutions.net/sensors/user-manual-for-flex-sensor> -

User manual for flex sensors

<http://www.analog.com/en/products/mems/mems-accelerometers/adxl345.html> -

ADXL335 accelerometer datasheet

:<https://www.youtube.com/watch?v=I01sdzJHCCM>

**GITHUB REPOSITORY LINK :** <http://github.com/saqib1707>

**YOUTUBE VIDEO LINK:**

<https://www.youtube.com/watch?v=Vo-5UE0eXxY>

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