Wink Talk -Sign To Speech Converter

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Abstract - Technology has always helped the disabled to stand and show themselves as normal people. These differently abled people are also human beings with some extra talent and that talent would be exposed if and only if they could communicate like normal people. These people are mostly deaf and dumb. There are about 9 billion people in the world that lie in this category, out of which 1.3 billion people are from India. These people have a special language known as Sign Language that is used by them to communicate among themselves, But this Language is unknown by normal people and hence there is a barrier or a roadblock for us to have a talk / chit chat with people who are differently abled. This barrier majorly affects their educational, social and professional backgrounds. We need to provide a technology to bridge the gap between the communication of normal people to the people who are specially abled. Here is where this project has the utmost scope and it would be done by inserting a technology that converts the Language of Signs into normal Speech. Hence by using this, Specially abled people would have their signs converted into normal speech.

Key Words: Sign Language, Conversion of Signs to Speech, Arduino, Sensor Technology and Embedded Systems.

1. INTRODUCTION

This document is template. This project aims to build a Technology that would be of a great help to the people who are differently abled i.e. deaf and dumb people. In this project Sign Language that is used by differently abled people, would be converted into speech that a normal person speaks. That means, the hand movements of the people would be recognized and stored, then it would be converted into normal human understandable speech. We are basically building a technology or a device named WINK TALK that is a hand glove that converts sign language into speech. The reason behind the name is that it conveys that gestures can be a matter of communication too. The major problems that has been taken into consideration are: Deaf and dumb people communicating with normal people. 2. Communication between deaf and dumb people. To solve this problem we have used two modes of operation in this project. The actions performed by the deaf and dumb people are measured using resistors flex sensor attached to gloves in a hand of the user. These flex sensors give the output as per bending of sensors and their resistance value. Once the user or the person who is disabled wears the gloves and whenever an action for sign language is performed, the voltage value that is obtained and the action corresponding it is identified by Arduino Uno (microcontroller). Bluetooth is used as a device to connect Arduino to the sound output like a speaker. Speaker is used to play the respective sound. Arduino IDE is used for compiling software coding and simulating the design. This project detects the movements of deaf and dumb people and results in action shown and converts it internally into speech and then plays the stored speech output in the speaker. Speech and gestures are expressions, which are mostly used in communication between human beings Getting data from the user is the first step. The second step is recognizing the sign or gesture once it has been captured. The third and the most challenging step is to convert it into speech and make the glove speak like a human!. In this

project, we are intended to design a simple technology that uses embedded system based device for solving this issue and bridging the gap between normal people and specially abled people.

2. SYSTEM DESIGN

HARDWARE USED-

1. Arduino UNO

The Arduino UNO is an open-source microcontroller board based on ATmega328P (microcontroller) and it is developed by Arduino.cc. The Arduino Uno board is equipped with sets of digital and analog (I/O) pins which are interfaced to various expansion boards (shields) and other circuits. It is programmable with the Arduino IDE i.e. Integrated Development Environment.
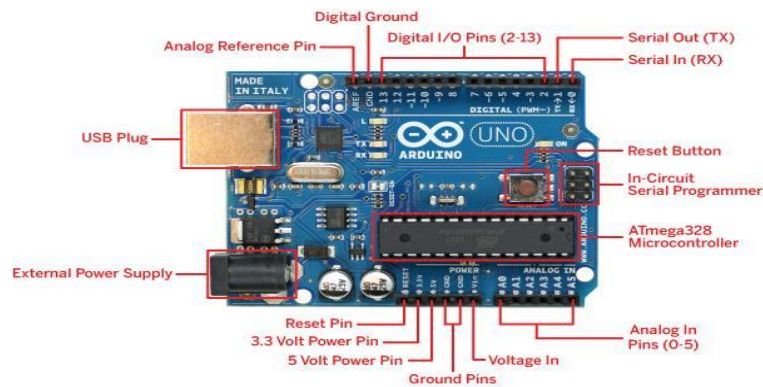

Fig-1: Arduino Uno 1

2. Bluetooth Module HC-05

HC-05 Bluetooth Module is not so difficult and quite easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. HC-05 Bluetooth module provides switching mode between master and slave mode which means it does not use either receiving or transmitting data.
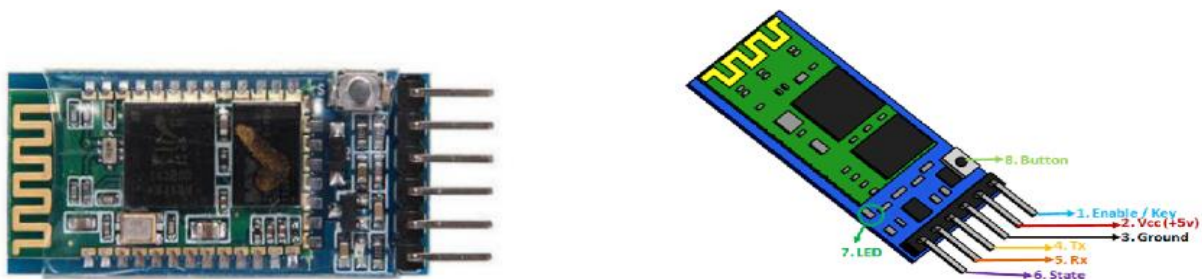

Fig-2: HC-05 Bluetooth Module

3. MPU 6050

The MPU 6050 is a 6 Degrees of Freedom or a six-axis IMU sensor that means it gives six values as outputs : 3 values from the accelerometer and 3 from the gyroscope. The MPU 6050 is a sensor based on MEMS technology (micro electro mechanical systems).
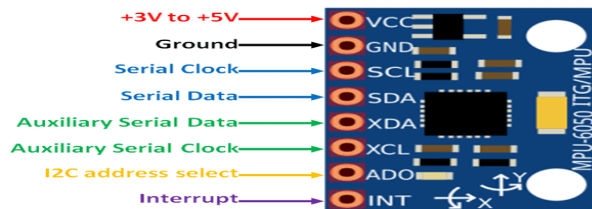

Fig-3: MPU 6050 1

4. Flex Sensors

Flex senor is a type of sensor which measures the amount of bending or defection based on resistance check. These flexes are made up with carbon surface on a plastic strip, when this strip is bend or deflected then the resistance of this flex sensor is changed. It is also called bend sensor. Due to sits changing resistance is directly proportional to amount of bend.

Fig-4: Flex Sensor

5. Gloves

Gloves are the main thing in this project as everything will be embedded in the gloves making it a device or a technology model that would be helpful for the conversion of sign to speech. Black 3/4th Arm length gloves are used here.

Fig-5: Gloves

SOFTWARE REQUIRED-

- Windows OS
- Arduino IDE

The **Arduino integrated development environment (IDE)** is a cross-platform application for Windows, macOS, Linux that is written in the programming language Java. It is used to write and upload programs to Arduino Uno board. The source code for the Arduino IDE is released under the GNU General Public License, version no 2. The Arduino IDE supports the languages C and C++ which uses special rules of code structuring. The Arduino IDE supplies a software library from the Wiringproject, which provides many common I/O procedures. User-written code only requires two basic functions, 1. for starting the sketch and 2. for the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution.

3. LITERATURE SURVEY

Generally Deaf and dumb people use sign language for communicating with each others, but they have difficulty in communicating with those who don't understand sign language. Our project is to lower this barrier in their communication. Here we use a Wired data glove fixed with flex sensors on each of the fingers. Usually sign language provides signs for determining words as whole. The working of flex sensors or bend sensors are totally dependent on their variation in resistance. Their resistance changes depending on the amount of flex or bend that the sensor experiences. The sensors responses are fed to the microcontroller, here the device will recognize the sign language for Alphabets and Numbers, and it will display the message in the LCD display and speak it aloud. With the help of embedded systems, developing a device that would be used for translating sign language will assist in reducing the communication gap between speech and hearing impaired people and normal people.

4. DESIGN PROCESS

The main part comes while designing of this system. The design is the most crucial part of making or producing a model and based on the circuit of the model, the device that would be laid in technology would be completed.

Circuit Diagram: The Circuit diagram consists of the connection of all the sensors, actuators, microcontrollers etc..These connections leads to the working of the device with more efficiency and accuracy. This circuit consists of Arduino, Flex sensors, Bluetooth Module and accelerometer combined gyroscope named MPU 6050.
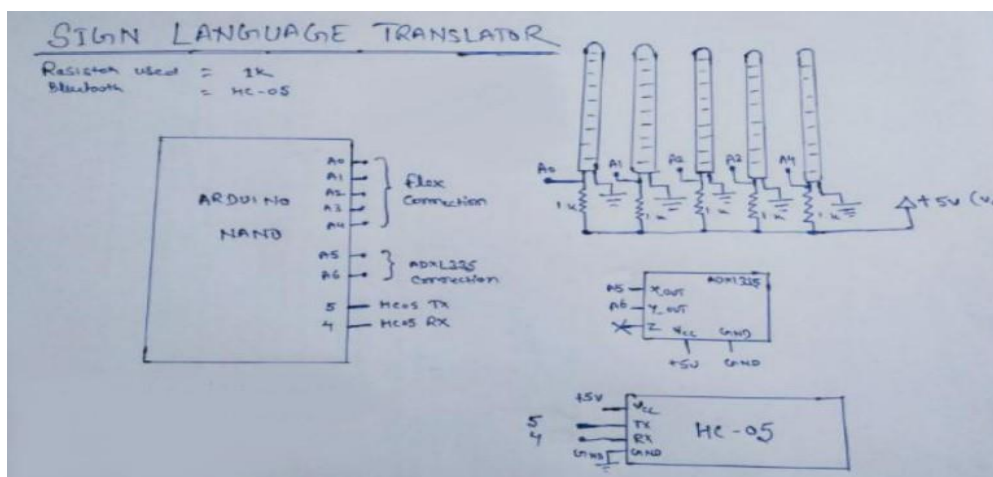

Fig-6: Circuit Diagram

Connections:

1. Arduino Uno with MPU 6050

A0 to X, A1 to Y, A2 to Z, +5v to VCC, GND to GND

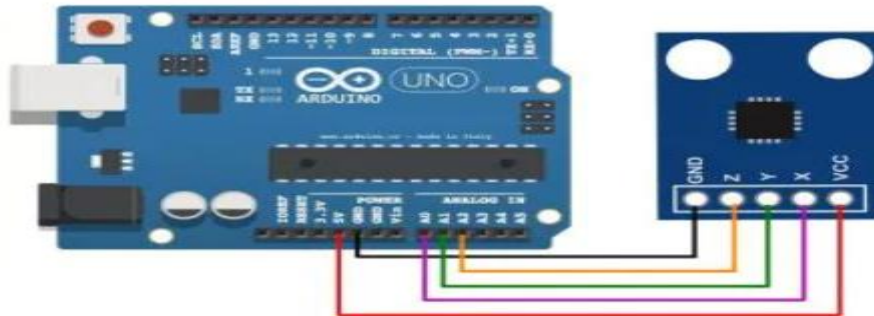**Fig-7**: Arduino to MPU connection

2. Arduino Uno to Bluetooth Module HC-05

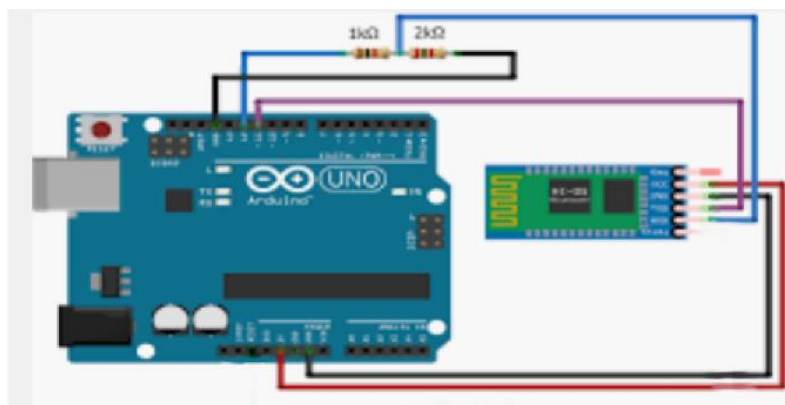12 to TX, 09 to RX, +5v to VCC, GND to GND

Fig-7: Arduino to HC-05

3. Arduino to Flex sensors

Flex 1 - A0 to GND, Flex 2 - A1 to GND, Flex 3 - A2 to GND,

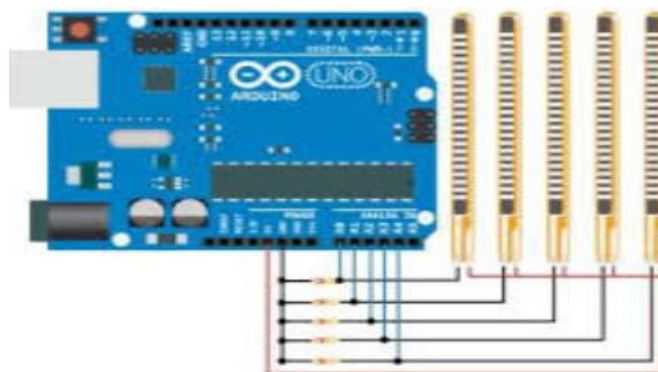 Flex 4 - A3 to GND, Flex 5 - A4 to GND, And one pin of all flexes to VCC

Fig-8: Arduino to Flex Sensors

5. WORKING OF WINK TALK

The working model of this paper i.e Sign to Speech converter consists of various sensors and controllers that actually help in the proper working of the model. Now, this device is made by keeping in mind about how to cultivate the model according to the full use of specially abled people and harvest results as outputs generated by the happy faces of the people who would be successfully communicating with normal people and exhibiting their talents and enjoying life just as normal people. The main aspect of the Working algorithm is the HMM i.e. HIDDEN MARKOV MODEL. This model has the proper coding and things done for accurate results. The hidden Markov model is a statistical model in which the system is assumed to follow a Markovian process with finite hidden states. The advantage of hidden Markov modeling technique is its ability to determine the sequence of occurrence of states in a gesture by using the transitional probability metric.

The most probable sequence is determined by the Viterbi Algorithm. HMM has been widely used in many applications, such as: (1) Speech recognition.(2) Activity recognition from video and (3) Gene finding and gesture tracking. The extracted features corresponding to each gesture are used to train the hidden Markov models. d. HMMs are used to synthesize speech in the text-to-speech synthesis unit which is unlike existing sign-to-speech converters where pre-recorded audio files are playedback. Hence, the proposed conversion system is capable of handling a large vocabulary using a text-to-speech synthesizing unit. The Algorithm would first collect the data set of each and every sign that is performed by the movement of hand of the disabled person. The values would be stored according to the bend resistances of the flex sensors. Then the algorithm may train each data set according to the number of signs and then recognize the signs according to the values stored by the bends. The recognized sign would then be converted into a speech and the output would be generated.
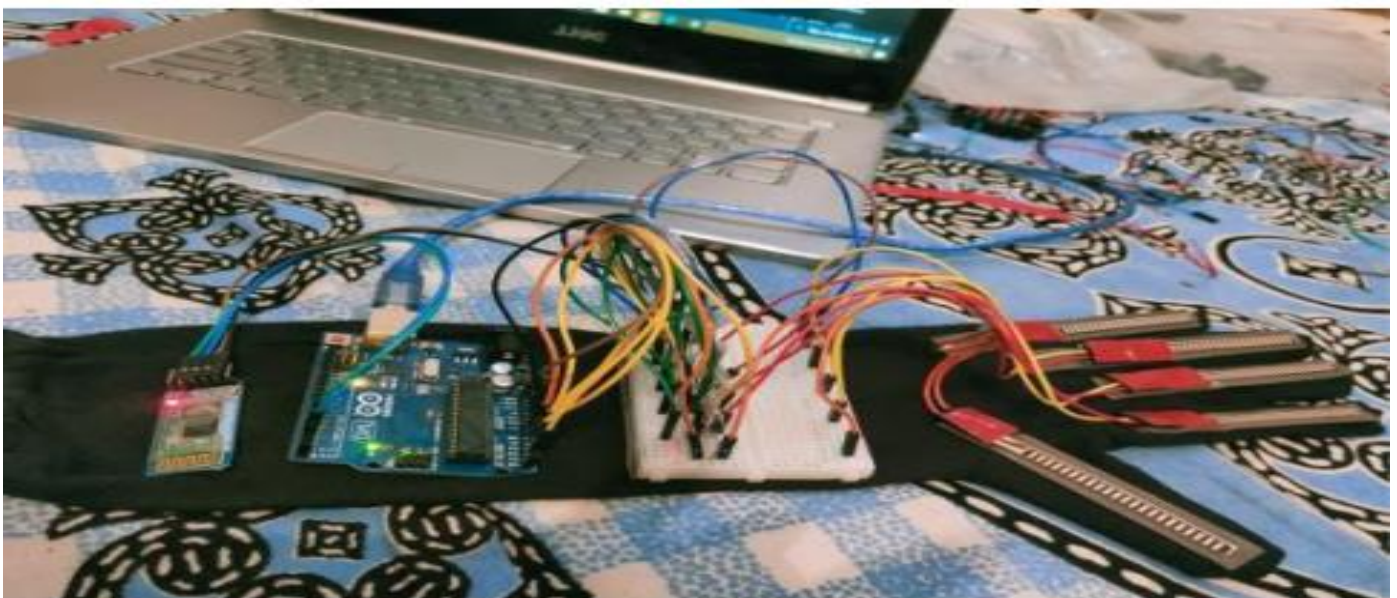
FINAL IMAGE OF WORKING MODEL:

Fig-9: Implementation of Wink Talk

6. FUTURE ENHANCEMENTS

Future Enhancements on this model includes expanding the platform to POS i.e. (Phone operating system). Integrating a speech-to-text module to understand the user, speaker to interact with the user verbally. A system which would fully be based on the technology that could understand each and every word and converts it from words to whole sentences and this can easily be done by the Deep Neural network and natural language processing with some of Artificial Intelligence technologies.

7. CONCLUSION

In conclusion, the proposed model is a fairly low cost system which can provide the user: power to do anything by doing almost nothing. This helps improve the living standards and also provide a safe environment where one can rest without any worries of break-ins or any kind of mishaps.This system aims to lower the communication gap between the deaf and dumb community and the normal world. The project proposes a translational device for deaf-mute people using glove technology with flex sensor and an voice module on to a glove to detect the gestures of a person. At last it can efficiently translate Sign Language gestures to speech output without any disturbances.

8. REFERENCES

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