Gesture Based Vocalizer for Deaf & Dumb

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***Abstract*– We proposed the Gesture based vocalizer for Deaf & Dumb. Gesture Vocalizer is a social cause project. The survey found that hearing-impaired people found it very difficult to communicate with others. Hearing-impaired people usually speak with hand gestures, and it is difficult for other people to understand sign language. It implements a gesture-based vocalizer that can recognize all hearing-impaired gestures, convert them to voice, and display them on the LCD screen. Basically, the data glove contains two types of sensors: a flex sensor and an accelerometer as a tilt sensor. Wireless data gloves are used. This is a standard cross glove with flexible sensors along the length of each finger and thumb. Dumb can use gloves to perform hand gestures, which are converted into voice so that others can understand their expression. This system helps dumb people communicate with others. A wearable glove controller is designed with flex sensors attached on each finger, which allows the system to sense the finger movements, and an accelerometer, which are used to sense the hand movement of the disabled person. The wearable input glove controller sends the collected input signal to the system for processing. The system uses Random forest algorithm to predict the correct output to an accuracy of 95% on current training model.**

***Index Terms*—Flex Sensor, Arduino Nano, HC-05, Gesture Detection, Arduino Bluetooth Text to Speech Converter**

I. INTRODUCTION

In recent years, the number of victims of hearing and speech disorders due to congenital defects, oral diseases, accidents, etc. has increased rapidly. When voice-impaired people talk to ordinary people, they find it difficult to understand and ask the hearing-impaired to show gestures for their needs. Dumb have their own language to communicate with us. The only thing is that we have to understand their language. Sign language is a communication skill used by the hearing impaired and silent people to convey meaning using gestures instead of sounds, combining hand shapes, hands, arms, body orientation and movement, and facial expressions. Express the speaker's ideas in a fluid manner. However, in most cases, the average person finds this sign language difficult to understand. People who cannot speak or who cannot speak due to an accident have difficulty in communicating a message to society. To overcome this, we came up with the idea of "SMART GLOVE". Communication is the most basic and important form of interacting with anyone. Sign language, or sign slanguage, is therefore used to communicate with the deaf and the mute. Dumb people use standard sign language, which is not easy for ordinary people to understand. Also, there is no standardized sign language defined globally. People with hearing and speech impairments cannot work normally with others. Vocalizer converts sign language into speech that can be understood by blind and non-blind people alike. The Gesture Vocalizer is a device designed to enable the mute, deaf and blind community to communicate and communicate with the general people. The system can be dynamically reconfigured to make it act as a "smart device" capable of handling any kind of sign language. Gesture voice is a data glove and a microcontroller that can detect almost any hand movement, and converts a specific movement into a human-recognizable voice. There is not always someone around to translate sign language, and not everyone can learn sign language. So another alternative is that you can use your computer or smartphone as an intermediary. A computer or smartphone can take input from a person with speech impairment and present it in text and audio format.

II. LITERATURE REVIEW

Five hand gestures: "come", "go", "turn right", "turn" left and “standing" are dealt with. Moving hands are drawn to different images, and touch is seen using features. A monitoring system is developed using monitoring methods. This system is not as reliable as photos when blurring can detect its distance in the right direction. And touch rate from distance and speed may not happen with a large amount of touch. Srinivas Gutta, Jeffrey Huang, et al. has shown progress in the process of building mixed sections with face-and-hand touch recognition activities and indicates feasibility test studies using the FERET database and touch images. It uses radial basis function (RBF) and Inductive decision trees (IDT) training network. An astonishing 96% accuracy was achieved with more than 200 variations of pictures. This program works very well but fails in situations where images are present dimmed or not light enough to properly identify a touch. The recognition algorithm is made up of Euler angles obtained using multiple sensory orientation. Real-time touch sensor system using IS-300 Pro InterSense Precision Motion Tracker used for recognition. This is a very good thing, a beautiful and very accurate method. Angles gain a sensor intuitively and the algorithm can detect and predict multiple touches. This method was used and validated by Jean-Christophe Lementec and Peter Bajcsy. Automatic touch detection of intelligent robot interaction improves auto-face recognition systems or touch. It was a

huge database built-in that keeps all possible actions. For efficiency and naturalness, apply a few techniques in each step of touch recognition; reading once the release of shared information, representing touch as a sequence of collections.

Technology used to detect hand gestures using a flexible sensor, gyroscope and Intel Galileo Gen2 IoT Kit. Here, different touch movements are detected as input and processed in order to generate voice help using a real-time IoT touch recognition system. Device has flexible home automation applications that control a variety of touch functions such as, turn on / off basic electrical appliances the main goal being low-level design and use. an expensive cable-operated glove, connected to a computer using MATLAB or Octave, with high level of touch recognition accuracy. Using Hall Effect sensors once a hand accelerometer is detected. Using MAT lab the input data was processed again and the message deleted. A new way of translating sign language using a portable glove. It uses a pair of LED-LDR, zigbee and microcontroller, touch was detected. The data is then processed analog to digital converters and equivalent ASCII values. Then the results of compliance touch are displayed.

III. IMPLEMENTATION

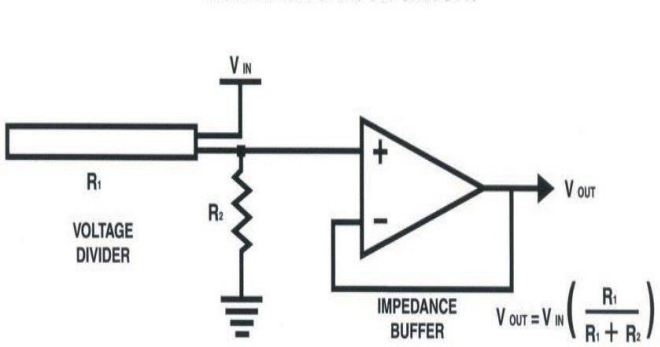
Understanding the Working: The pushbutton is attached with a 10k-ohm resistor, known as a pull-down resistor, from the ground to the switching pin connected to the Arduino. It connects the PIN down when the switch is turned on, so it reads DOWN when there is no voltage entering the switch. When the push button is pressed, the position of the button is set to HIGH and the audio signal is adjusted via Bluetooth. As soon as the button is released i.e. button mode goes to LOW and regional break. Turn on your phone's Bluetooth settings and search for Bluetooth devices. In the list of available Bluetooth devices, pair your phone with the device name HC-05 using passcode 1234 or 0000. Then open the Bluetooth Arduino application to convert text into speech. It will show you a list of paired devices. Select HC-05 as shown in the pictures below. When you press a button, the app will speak and display the current time and date. Voice volume and speed can be controlled within the app.

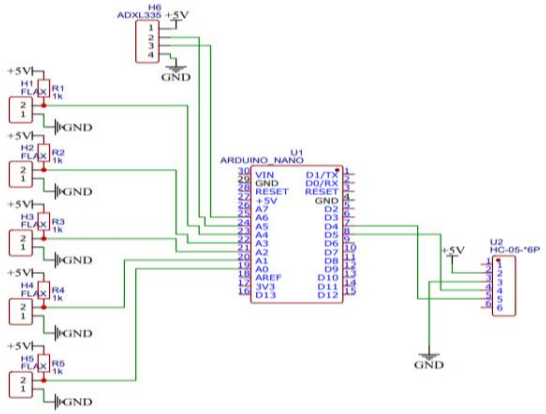
Building the Data Glove: The flex sensors are sewn on the glove, one on each finger. Flex nerves detect and record finger movements. Finger bending is changing the flexible sensor resistance thus acquiring a touch made on the basis of the predefined values.

Pairing the Circuit with the Device: Once the circuit is turned ON and the beep sound has come after a few seconds, it indicates that the device is ready to be paired to the Bluetooth Device (Android Phone). The device would be available as HC-05. Connect to it with your phone using the password '1234'.

Making The Gestures & Observing The Output: Once both the devices are successfully connected, open the Arduino speech to text converter application on the android device. Look for the Bluetooth module HC-05 in the list and tap on it. Once it shows connected, start making the gestures for which the commands are saved. For every gesture that has been made, the phone will display the respective command and read it out loud too.

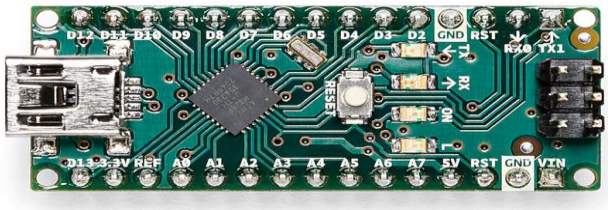
IV. SYSTEM ARCHITECTURE





Flex Sensor: Flex sensors play the major role in Gesture Vocalizer. Flex sensors in gesture vocalizer is used as bend sensors. We connect the flex sensors at each finger of hand. Flex sensors are used to detect the bending of fingers. We are using the flat resistance of 10K. the voltage varying between 0-5 volt. As the bending of finger is minimum the voltage at output is maximum that is 5v and vice versa. The resistance value is converted into voltage.

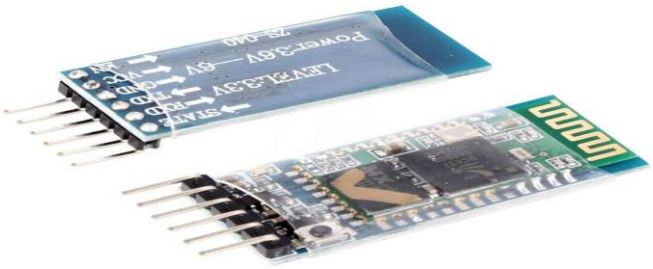
Arduino Nano: The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.



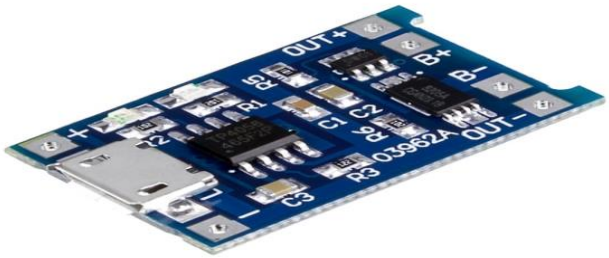
PCB Board: Printed circuit boards (PCBs) are the basic building block of most modern electrical equipment. Those simple single horizontal boards are used in your garage door opener, on a six-level board on your smart watch, up to 60 layers, high density and high-speed circuit boards used for computers and servers, printed circuit boards are basic where all other electronic components are assembled. Semiconductors, connectors, connectors, diodes, capacitors and radio devices are connected, and “speak” to each other through a PCB. PCBs have mechanical and electrical features that make them ideal for these applications. Most of the PCBs produced on Earth are solid, about 90 percent of the PCBs produced today are solid boards. Some flexible PCBs, which allow circuits to be folded and folded in shape, or are sometimes used when a flexible circuit will survive hundreds of thousands of flexible cycles, without breaking the circuit. These flexible PCBs cover about 10% of the market..

HC-05 Bluetooth Module: It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer

applications. It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air. It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).

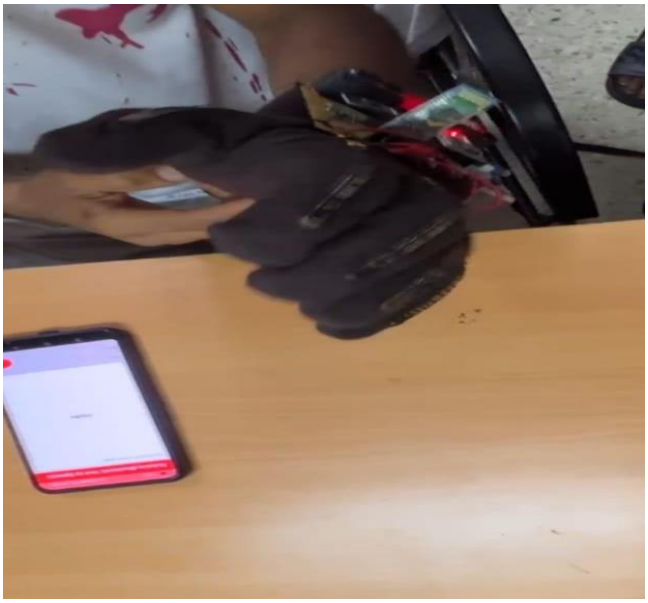


TP-4056 Charger: The TP4056 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries. Its SOP package and low external component count make the TP4056 ideally suited for portable applications. Furthermore, the TP4056 can work within USB and wall adapter. TP4056 other features include current monitor, under voltage lockout, automatic recharge and two statuses pin to indicate charge termination and the presence of an input voltage.



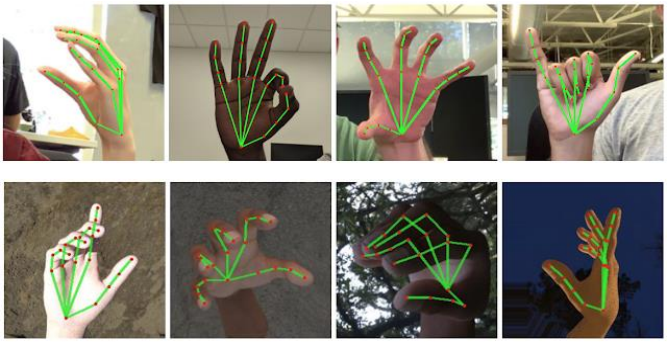
MT3608 Booster: The helping kit will consist of various devices such as a wheelchair, a robotic arm, etc. These devices will be controlled by the mobile application and will help paralyzed patient with their daily tasks.

ADXL355: The ADXL355 are a part of a family of low noise density, low 0 g offset drift, low power, 3-axis MEMS accelerometers with selectable measurement ranges. The ADXL355B supports the ±2 g and ±4 g ranges, the ADXL355C supports the ±2 g and ±8 g ranges. The EVAL-ADXL355-Z are simple evaluation boards that allow quick evaluation of the performance of Analog Devices new series of low power, low noise, low drift 3-axis, MEMS accelerometers. The series consists of both analog and digital

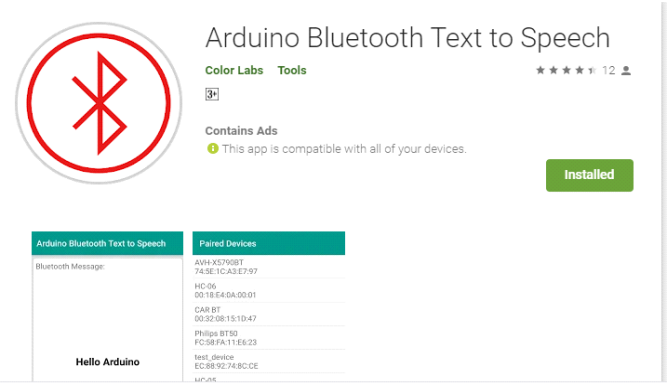


output devices, supporting a variety of Full Scale Ranges (FSR).

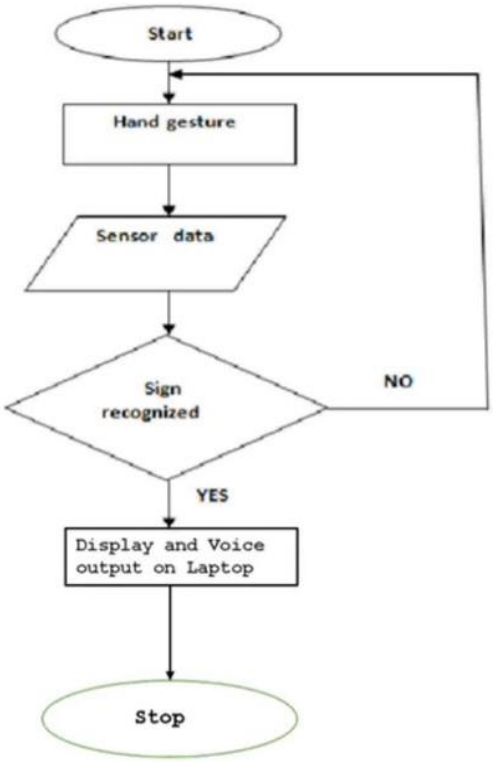
Gesture Detection: Gesture detection is the most important part of this module. The bending of the finger is detected in this module. The bending of the finger has many numbers of bends, and the system is very sensitive to the bending of the finger. Now the next step is to combine the movement of each finger. It can be named for particular gesture of the hand. Now the system reads the movements of four fingers. Instead of reading the individual finger it reads all the fingers simultaneously. After reading the bending of the fingers, the system checks whether the bend has some meaning or not. It also checks the bend is useless or undefined bend.



Arduino Bluetooth Text To Speech Converter: Arduino Bluetooth CH-05, CH-06 can communicate with the app by sending text (new line at the end of each transmission). It will convert the text received to speech.



V. RESULT ANALYSIS



System that could read user-generated touch values, predict touch output, display on an android phone, and provide audio output too. Database of all alphabets and frequently used words created. By using those databases, the machine trained and created a model. Then a set of data for all alphabets are grouped and organized to train machines with reduced variability and make sure the model remains normal and is beyond the minimum power. When input taken from sign language or word, input passed through a trained machine and the approximate projected value and playback sound as an exit. Then there is the relatable structure of the letters of the alphabet compared with other characters for quality testing spelling and prediction model accuracy. Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of ensemble learning, which is a process of combining multiple classifiers to solve a complex problem and to improve the performance of the model. As the name suggests, "Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive

accuracy of that dataset." Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output.

The bending of the finger has many numbers of bends and can be assigned following meanings.,"Hello" "I am Fine" "Okay" "Thank You" "Sorry" "Help Me" "Give Me Direction" "Give Me Water" "Bless You" "Go Away" "Go to Home" "Fan" "Light" "Give me my Mobile" "You are Welcome" "Give me my File" "Something wrong" "You are bad" "I am Hungry".

VI. CONCLUSION

This program is useful for deaf, Dumb and blind people to communicate with one another and with ordinary people. The mute use their sign language which is difficult so that ordinary people and the blind could understand. This system converts sign language into proper speech. It is easy for blind and ordinary people to understand language. Sign language is translated into some tangible objects so that they can understand the deaf. The text says display on the phone's screen. Sign language is a useful tool for communication between the deaf community and ordinary people. This project is basically designed to reduce the communication gap between the mute people and the general. For this project the dumb people can use data gloves. Used to make sign language and will be converted into words so ordinary people can easily understand and express themselves so that the deaf can read it on the phone's screen. The project was aimed at developing a portable speech synthesizer and vocalizer the speech disturbed the people. The upgraded system can detect 8 different hand gestures and convert them into voice output. The touch of a hand can be measured depending on user preferences. Outputs can also be provided according to user requirements. The project is also expanded at home default using hand gestures. Various household appliances such as lighting and fans can be controlled using hand gestures. Data from the system is transferred to the home electronics controller using 433 MHz radio signals. Addition of accelerometer in conjunction with flexible measuring sensors and wrist movement. The system can be updated to hear both and hand touch. This will help us increase the number of touches which involve the movement of the wrist and the finger of both hands thus increasing the number of results. Creating a custom voice module that can provide additional volume outputs normally available on the market at the same time costs slightly when considering mass production. Generate as many words as possible and improve machine learning. A program that can translate different words to produce and improve a sentence on its own. This will reduce the load on the system due to the storage of large items and make the system dynamic and flexible. Contact voice assistants such as Siri or Alexa to produce voice effects instead there is a voice module. This can make the system more compact and flexible used on various platforms such as cell phones that would make it portable. Use hand gestures to control vehicles. This can be especially helpful in a wheelchair that people find difficult to navigate and need human help.

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