Smart Gloves For Sign Language Communication

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Abstract- *Communication between impaired person and regular man or woman is usually challenging and inconvenient., in which it creates an incredibly little space and elaborate for them to speak, that's essential a part of human lifestyles. Sign language is the primary communication medium for the deaf/dumb people. This mission objective to bridge the conversation gap among normal and deaf/dumb character through designing a portable glove which captures the user's signal language gestures, recognize and outputs the translated text and speech on a smart smartphone. The clever glove carries five flex sensors, gyroscope, Arduino NANO, Bluetooth module. Using a help tool within the communication for a deaf-mute man or woman may deliver him/her a better nice of existence to paintings in primary situations.*

Keywords- Flex sensor, gyroscope, Arduino nano, Wireless communication, Display and Audio.

I. INTRODUCTION

Indian Census in 2011 estimated that over 26 million human beings go through from some sort of incapacity that is equal to 2.1% of the complete population. The most frequent kinds of disabilities are incapacity in motion (that debts to 20.9%), listening to impairment (19.5%), and speech impairment (7.68%) [1]. For example, Imagine a state of affairs in which a regular character wishes to speak with a individual having a listening to incapacity located at a some distance from him ,then he might not be capable to trade his/her thoughts.

The Internet of Things is the internetworking of bodily units ,buildings ,vehicles and different objects embedded with electronics ,sensors ,software ,actuators and community connectivity that allow every objects to accumulate and change data. Typically, IOT is predicted to provide boost connectivity of devices, structures and offerings that goes past machine-to-machine (M2M) communications and covers a range of protocols, area & functions [2].

II. RELATED WORK

Much of our researchers had centered on making use of flex sensors to tune the orientation of fingers and IMU to song the action of hand in three-D space. An Idea of Hand-talk Gloves proposed by Ambika Gujrati et.al, introduces the idea of using flex sensors embedded on a glove to track the orientation of fingers [3].

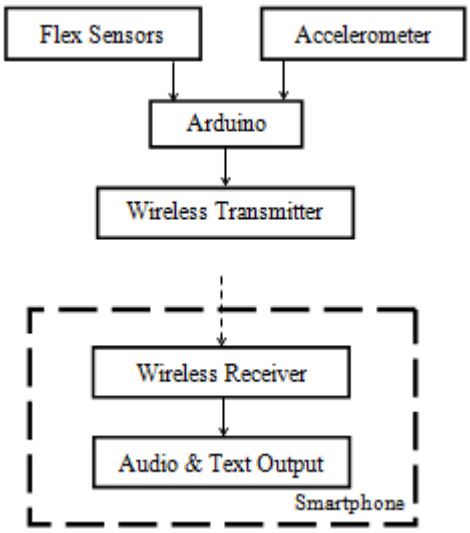
In [4] Ikeda et al have invented a signal language enhancing equipment which consists of a glove-like sensor that detects finger action in the signal language and converts it into electrical signals. Other add-ons encompass a signal language phrase data-editing device, a signal language phrase dictionary, a signal language sentence statistics-enhancing device, a signal language animation-synthesizing system and a show unit for exhibiting the signal language animation produced through the signal language animation synthesis device. The signal language phrases are saved as time collection data. Additional statistics will be brought to it the use of the word-editing device. The dictionary shops the time collection statistics of signal language whilst the sentence data-editing system reads the statistics and sends it for animation synthesis.

The paper via Ahmad Zaki Shukor et at [5] compares the more than a few strategies of signal language detection that are in vogue particularly the records glove method, visible strategies that encompass utilization of Computer Vision strategies and a approach the usage of 'virtual buttons'.

In the paper published by Gunasekran. K and Maniikandan R.[6] have used an PIC16F877A microcontroller & APR9600 audio synthesizer to convert the sign language to the respective voice output.

III. MATERIALS & METHODS

The proposed method uses the five flex sensors andone accelerometer/Gyroscope sensor ,which are directly connected to the arduino Nano controller. Following figure shows the block diagram of the proposed method.



A. Flex Sensors

A flex sensor or bend sensor is a sensor that measures the amount of deflection or bending. Usually, the sensor is stuck to the surface, and resistance of sensor element is varied by bending the surface.

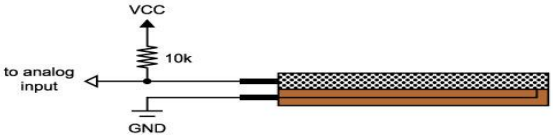


Fig 2: Flex Sensors

B. Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

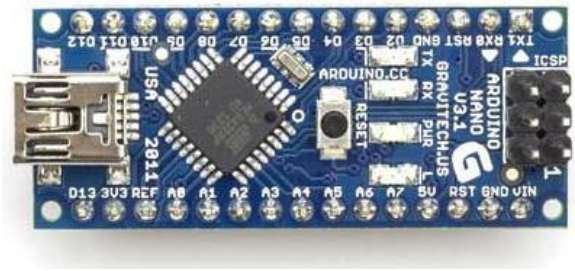


Fig 3.3: Arduino Nano

C. Accelerometer

An accelerometer is a tool that measures proper acceleration. Proper acceleration is the acceleration of a body in its own instantaneous rest frame; this is different from coordinate acceleration,

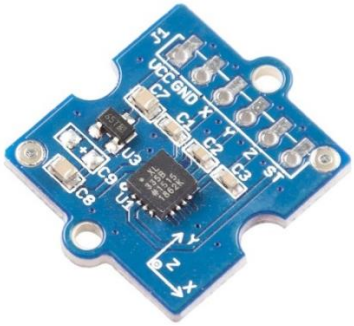


Fig4: Accelerometer

D. Bluetooth (HC-05)

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.This serial port Bluetooth module is fully qualified Bluetooth V2. 0+EDR (Enhanced Data Rate) 3Mbps Modulation withcomplete 2.4GHz radio transceiver and baseband.

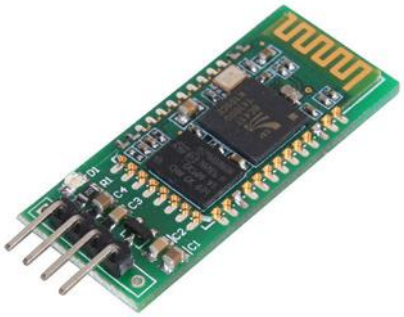


Fig 5: HC-05 Bluetooth Module

There are total 5 flex sensors used for the five fingers over the gloves and the accelerometer is fitted on the back of the palm of glove so as to capture the orientation of the hands along with the angle of bending of the fingers.

The orientation of the hands triggers the accelerometer resulting the arduino to take the signal from the flex sensors. The working is shown below:

- Start
- Initialize all the sensors to 0
- Tilt the hand to particular angle to trigger the accelerometer
- Read the inputs from the flex sensors
- Match it to database

- Transmit the data to the smart phone(receiver)
- Display the appropriate output.

Following table gives the output values of the prototype:

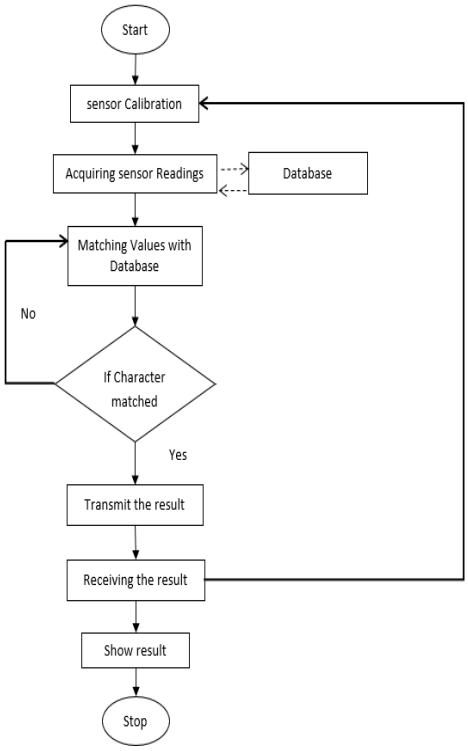
TABLE I Output Chart

F1	F2	F3	F4	F5	OUTPUT
1	1	1	1	1	"A"
1	1	1	1	0	"B"
1	1	1	0	1	"C"
1	1	1	0	0	"D"
1	1	0	1	1	"E"
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
1	1	0	1	1	"Ok"
1	1	1	0	0	"Water"
1	1	1	0	1	"Hello"
1	1	1	1	0	"Bye"
1	1	1	1	1	"Hi"

As the flex sensors gives output in the form of 10k ohms, in this project we have attached the each finger with binary values (0 or 1), On bending, the sensors create some resistance ,it is considers as 1, whereas 0 on straight .

As there are 5 flex sensors the output will be of the form 25 which is 32 outputs , following table shows exact calibrations.

System Flow

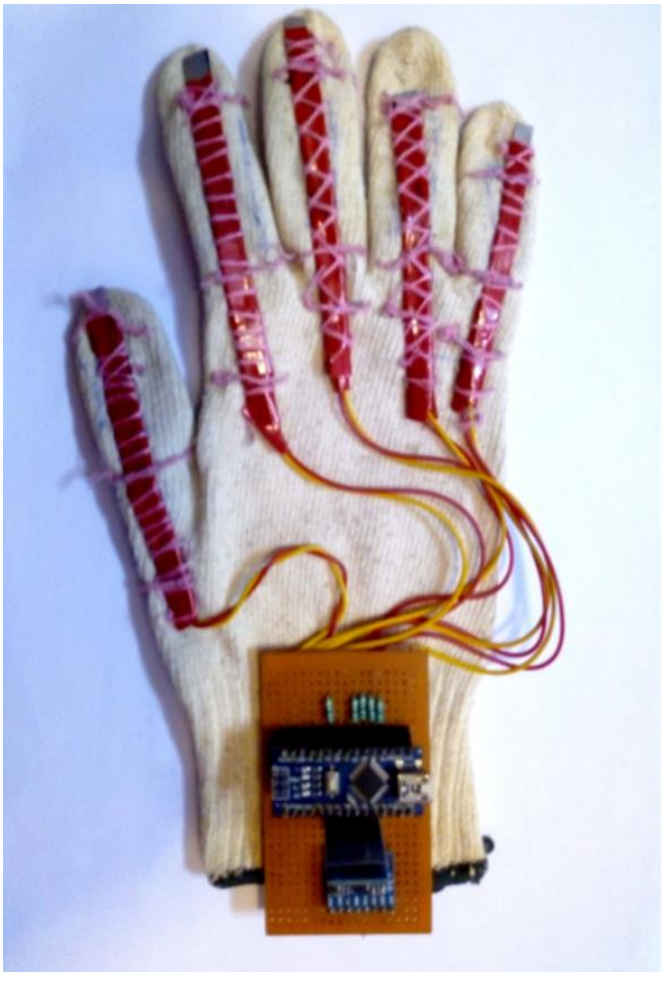


Start the system, set all the sensors values to 1. When user performs hand gesture/signs acquire sensors readings then match those values with database. Prior values of hand gesture will be stored on database, if the values are matched, then values are transmitted through Bluetooth transmitter those signals are received by Bluetooth receiver then display a particular text on smart phone.

IV. RESULTS

The experiments are carried out for different hand gestures. There are totally five flex sensors, all five sensors work accurately. Since this smart glove cannot capture any facial expression. The glove is completely portable. The failures occur during sudden change in hand gestures. To overcome the failure there must be time delay between hand gestures.

The output of test data is approximately 95% due to error in the flex sensors. It is a real time project which can be future great utility for impaired people. In future it can also be used for paralyzed people.



V. CONCLUSION

By using this proposed system we can bridge the communication gap between disabled deaf and dumb people, to be interactive to our environment. And also the patient can access their needs in a time without any struggle in conveying their thoughts. This helps them more with ease and it takes away the need of continuous monitoring. By implementing these they can feel free to share their needs and requirements in time and without any struggle and delay.

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