

Sign to Speech convertor Gloves for Deaf and Dumb People

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ABSTRACT

Communication is a process which is vigorous, endless and irreversible but at the same time, it is reciprocal in nature. It is an unending process. Communication helps us to understand others, the incapability to communicate can lead to a lot of problems both personally and professionally. Most of the population don't comprehend gestures based communication. The thought planned in this paper is a keen glove which can alter over communication via gestures. The glove is embedded with flex sensors to recognize the hand movements. The prototype was tested for its possibility in converting Indian sign languages to voice output. Though the glove is proposed for sign language to speech conversion, but it is handy glove and finds it's applications in gaming, robotics and medical field.

Keywords: flex sensors, gloves, sign language.

1. INTRODUCTION

All beings on earth have settled means in which to carry their emotions and thoughts to one another. However, it's the ability of individuals to use words and language to transfer exact meanings that groups them apart from the animal territory. Poor communication, due to personal causes or a lack of adequate technology, will unavoidably lead to unenthusiastic, ill-informed that may begin to question on confidence in their skills and ultimately the organization as an entire. About 15% of the world's inhabitants lives with some form of incapacity, of whom 2-4% experience significant problems in functioning. The severe issue for the deaf and dumb civic is obviously the trouble in communicating with vocal people. These people communicate via sign language; however, the main subject is that the majority of people are not aware with sign language and they are not ready to learn this language. This created an idea to propose this project in which it will drastically facilitate and advance a communication method between the non-vocal and vocal individuals. This Project aims to lower the barrier in communication. It is based on the need of developing and electronic device that can translate sign language into speech in order to make the communication take place between the mute communities with the general public possible. The wireless data gloves is used which is normal gloves fitted with Flex sensors along the length of each finger. Mute people can used the gloves to perform hand gesture and it will be converted into speech so that normal people can understand their expression. A gesture in a sign language in a particular movement of the hands with a specific shape made out of them.

2. REQUIREMENTS

A. Hardware:

In the system design, flex sensors are attached to a hand glove, along with each finger length and recognizes a gestures. The output of the flex sensors will vary depending on the bending degree of each finger, and the analog output voltages, which are obtained from these flex sensors, are fed into the analog pins of Arduino Uno board. The analog to digital convertor processes these analog signals and converts them into digital signals. Moreover, the program stored in the controller will also convert the recognized gesture into its equivalent text information. The text information will be displayed on the LCD screen and the text to speech conversion will play out the sound through the speaker.

B. Software:

Arduino Software (IDE) was used to program the system. The flow charts of the codes are illustrated in Figures 4. Figure 4 shows the flow chart of the software design Once the user shows the gesture, the code checks whether the values are in range for the particular letter and if it is in range then we get the output in the form of text as well as audio, else the code will wait for new values and the process keeps repeating.

3. PROPOSED SYSTEM

The proposed system makes use of data gloves for data gaining (flex sensors) trailed by the presence of Processing unit and the output unit that brings an output. Fig.1 gives an insight as to what the proposed system shall look like on completion .This system customs a data glove for data acquisition to safeguard user friendliness. The proposed system makes use of data gloves for data gaining (flex sensors) trailed by the presence of Processing unit and the output unit that brings an output.

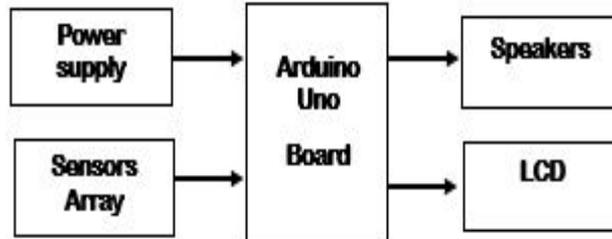


Fig 1. Block diagram

The proposed system makes use of data gloves for data gaining (flex sensors) trailed by the presence of Processing unit and the output unit that brings an output. Fig.1 gives an insight as to what the proposed system shall look like on completion .This system customs a data glove for data acquisition to safeguard user friendliness. Accurateness of proposed system can be increased by increasing number of sensors. The degree of bending of fingers harvests output voltage. Produced voltage is noted for respective finger and converted into digital form to get required voice. The data glove would be fitted with flex sensors along the length of each finger. The flex sensors output a stream of resistive values that change with degree of bend. The values so obtained are analog signals as they display varying voltages and are not precise. The values recorded by the sensors are measured accurately with the help of voltage divider circuit. These values are fed to the ADC (analog to digital converter) to get corresponding digital signal. This signal is fed to the micro controller. Processed signal is used to recognized gesture, and output information is displayed on LCD and speaker in terms of audio output.

A. Data Acquisition and Processing:

The Flex Sensor technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius the smaller the radius, the higher the resistance value as shown in fig.2

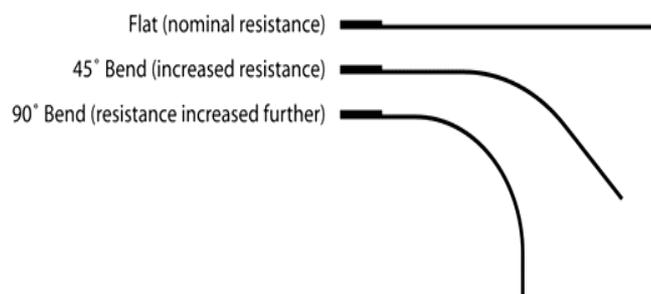


Fig. 2 Flex sensor

For convenience we convert this resistance parameter to voltage parameter. For that we are going to use voltage divider circuit. A typical voltage divider circuit is shown below fig 3.

In this proposed system we have calculated the values with the help of following formulations.

$$V_{out} = (V_{in} * \text{sensor Value}) / 1023 \quad \dots (1)$$

$$R = R_{ref} * (1 / ((V_{in}/V_{out}) - 1)) \quad \dots (2)$$

Arduino can sense from 0-1023. 1023 is 5V. Formula to calculate tested resistor's value is given in equation (2).



Fig.3 Voltage divider

B. Output Modules:

The output will appear in the form of text on the liquid crystal display as soon as the sensed data is matched with the predefined data set. This text output is fed to the audio section. The speech of each text will play out through speaker.

4.SYSREM FLOW

The flow of the algorithm for execution of system is as specified in the fig.4. Before reading the analog values from sensors all the libraries are initiated such as liquid crystal and talkie. Then the sensed data is compared with predefined resistance values. If values matches then letters to specific resistance ranges are assigned. The text is displayed on the LCD. With the help of talkie library the text is converted into speech and fed to the sound mechanism to get audio output. In case the sensed values don't match then the controller keep reading the values from flex sensor.

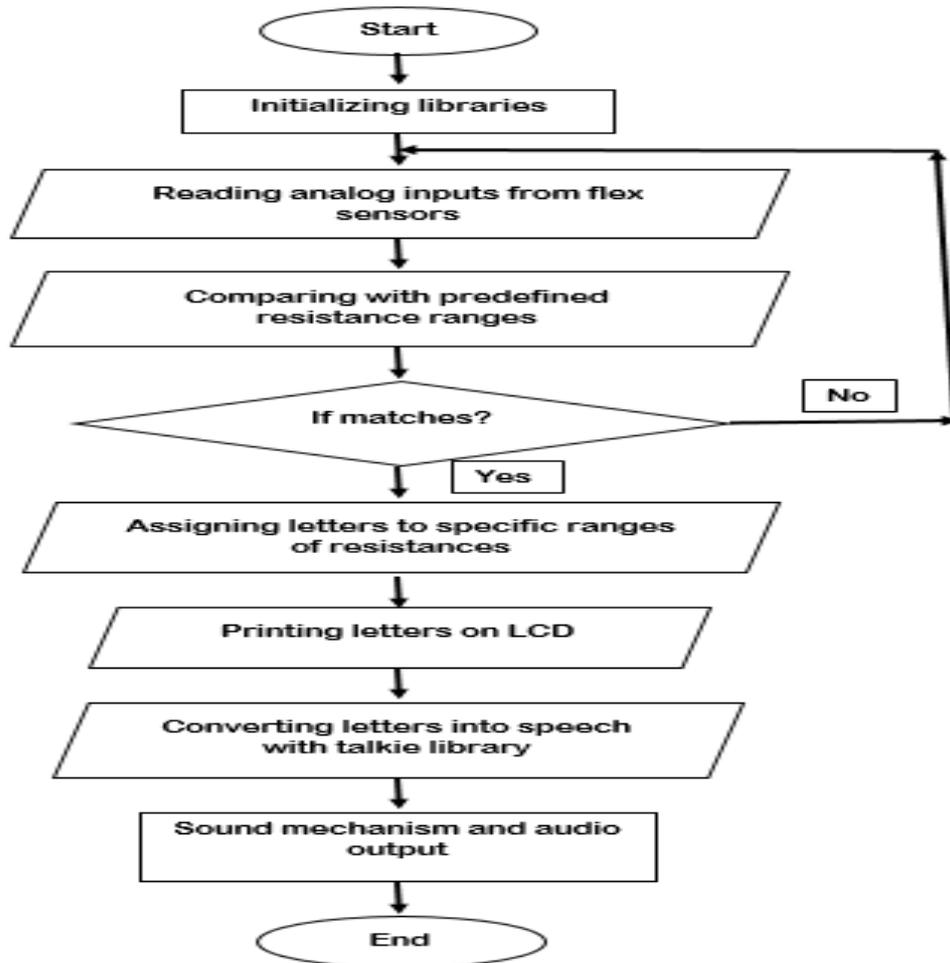


Fig 4. System flow

5. EXPERIMENTAL RESULTS & DISSCUSSION

The first column consists of unique text for gesture and remaining column consisting of resistance values corresponding to each finger. The values represents the change in voltage for bent in the flex sensor. This ensures unique set of resistance values for representing each gesture.

Text	Finger1	Finger2	Finger3	Finger4
A	≥ 21500	≤ 26500	≤ 22000	≤ 20800
B	≤ 21500	≥ 26500	≤ 22000	≤ 20800
C	≤ 21500	≤ 26500	≥ 22000	≤ 20800
D	≤ 21500	≤ 26500	≤ 22000	≥ 20800

Table I: Resistance values of gestures

6. CONCLUSION

Projected system is planned to lower the communication barricade between the deaf or mute people and the normal world. This system recognizes sign language using sensor gloves. Thus voiceless people can use the gloves in order to achieve several signs and will be transformed into speech so that they can effortlessly communicate with ordinary people. The glove can be used to do the various tasks for different applications of computer. Glove can also be used for gaming, TV controlling, arm controller etc. Likewise two gloves can be established in order to cover numerous other hand gestures.

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