

HAND GESTURE VOCALIZER

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Abstract— Hand Gesture Vocalizer is a social purpose project that helps people to uplift who are speech, blind and hearing impaired, by facilitating them to have a better communication with the public. In various researches it has been estimated that there are about 9.1 billion people in the world who are deaf, blind and are have speech impairments and they face a lot of problems whilst trying to communicate with society in their day to day life. Generally, sign language is used by the deaf , blind and ones who have speech impairments, but this becomes difficult for them to communicate with other people who do not understand sign language. Sign language which is used to convey information between people relies various body language, orientation and movements of the arm and fingers etc. This project is designed to address the need of developing an electronic device that can translate sign language into speech and display in order to remove the communication gap between the dumb and blind and the general public.

I. INTRODUCTION

Generally sign language is used by the blind, speech and hearing impaired people for communication but they find difficulty in communicating with others who don't understand sign language as Sign Language involves orientation and movement of hands, arms/body, combining of various hand shapes and various facial expressions to fluidly express the thoughts. As the sign Language is generally not a universal language. For sign language there does not exist a single standard, universally accepted scheme .So the main aims is to lower the communication barrier . The project is mainly based on developing a device that can translate sign language into

speech and text in order to make the communication take place between the mute communities with the general public easily . So, the main objective is to make a simple prototype by taking some of the gesture and convert it into audio and visual form so that they can understand by everyone.

It is designed to facilitate the communication among the dumb, deaf and blind communities and their communication with the normal people.

A microcontroller based Hand Gesture Vocalizer system which makes use of flex sensors and an accelerometer for gesture detection and the tilt detection respectively. In this the input values that are given or correspond to a particular gesture are then played as a voice message through a speaker as well as text on the LCD screen display.

II. METHODOLOGY

Hand Gesture vocalizer consists of flex sensors, an accelerometer and arduino uno. The flex sensors and the accelerometer are placed on the hand of the disabled person. For converting the hand movements or gestures into audio through an audio processing unit and visual data through an LCD display a microcontroller is used. A normal cloth glove is used and is fitted with flex sensors along the length of each finger and the thumb, which converts the every particular hand gestures into human recognizable audio and the display. Flex sensors are placed on the glove which converts the parameter like finger bend hand position angle into electrical signal and

provides it to an Atmega 328 controller. Controller takes action according to the particular gestures.

For the bend detection of fingers two flex sensors are used and for getting the tilt and the orientation of hand one ADXL335 3-axis accelerometer is used. These are embedded on the glove for gesture recognition. For storing and playing back audio messages an audio processor chip is used. An LCD display is employed which can displays the text messages, this can facilitate communication for people having hearing impairment

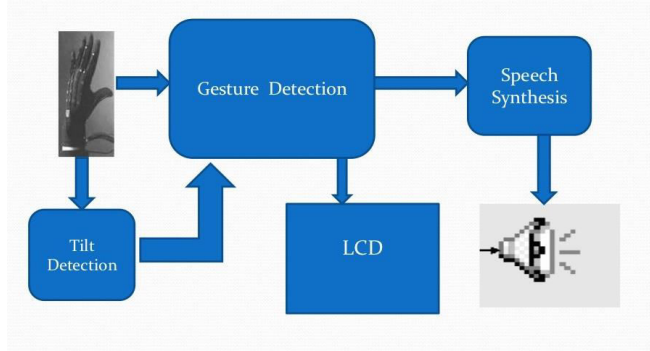


Figure 1-Block diagram[5]

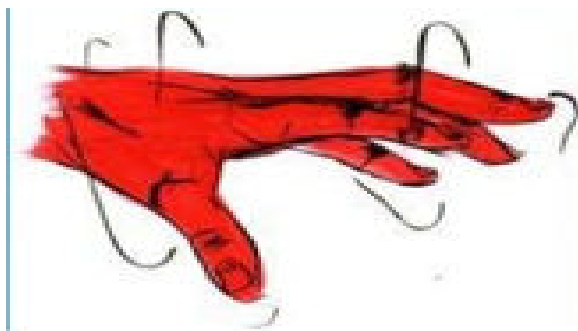


Figure 2-[3]

III. HARDWARE IMPLEMENTATION:

GESTURE DETECTION :-

The glove is equipped with five flex sensors. The sensors are placed on the four fingers and thumb of the hand glove. These sensors are analog sensors. They can be made unidirectional or bidirectional. Each and every bend or even a little bend of the finger can be detected by the sensors . The bending of each finger can be obtained into 10 different levels. The finger must be at one of these 10 levels at any stage and it can easily determine how much the finger is bent. After this process from the flex sensor the binary data is then sent to ATMEGA328. The next step is to combine the each movement of the finger and then name it a particular gesture of the hand.

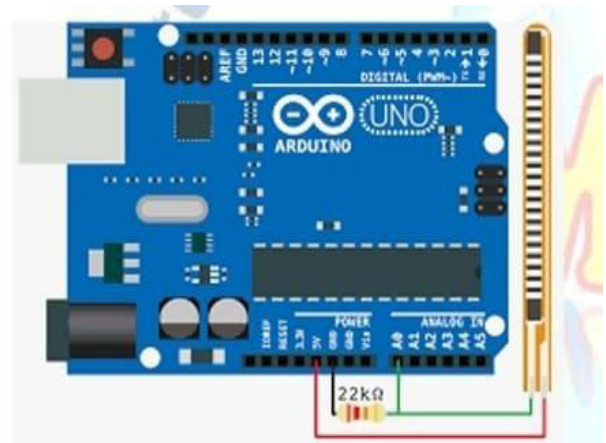


Figure 3-Interfacing Arduino Uno with the flex sensor [4]

TILT DETECTION :-

In the Hand gesture vocalizer system an Accelerometer(ADXL 335) used as a tilt detector . ADXL 335 is known as a three-axis analog accelerometer IC. The X, Y and Z acceleration are readed as analog voltages by the accelerometer. An accelerometer can figure out the angle it is tilted by measuring the amount of acceleration due to gravity . The accelerometer can find out how fast and in what direction the device is moving, by sensing the amount of dynamic acceleration. The main and the basic function of the accelerometer is detecting the tilting of the hand and then sending some binary data against meaningful gestures, to the microcontroller. After that the Microcontroller receives the data and saves them.

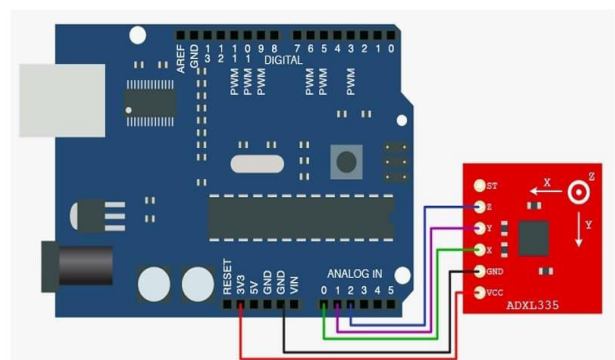


Figure 4-Interfacing Arduino Uno with accelerometer [6]

SPEECH SYNTHESIS :-

By the use of an audio processing unit a MIC, an amplifier circuitry and a speaker Speech synthesis is done . The function of this unit is to produce voice against the respective gestures. The data which is sent from the flex sensor and the accelerometer is received by the microcontroller and then it compares the received data with the predefined values. So on doing this comparison, the microcontroller comes to know that which particular gesture the hand makes. After that giving voice to each gesture is the last step of the system. A speech synthesizer IC

APR33A3 is used for this purpose. Audio corresponding to each gesture are recorded through the 8 channels of the APR. When the corresponding gesture is shown the address corresponding to each channel is sent to the speaker.

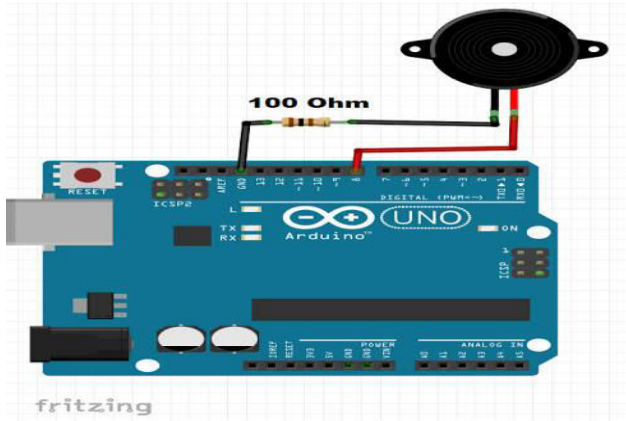


Figure 5-Interfacing Arduino Uno with speaker [8]

LCD DISPLAY :-

The output from the Flex sensor and accelerometer are also sent to the LCD display. The microcontroller checks each signal which is received and compares it with the already stored value.

The microcontroller takes the decision about what message should be displayed ,on the basis of this comparison.After the decision is made, the microcontroller sent an 8-bit address to the LCD. The received 8-bit address is the location of first character in the message that the LCD should display.

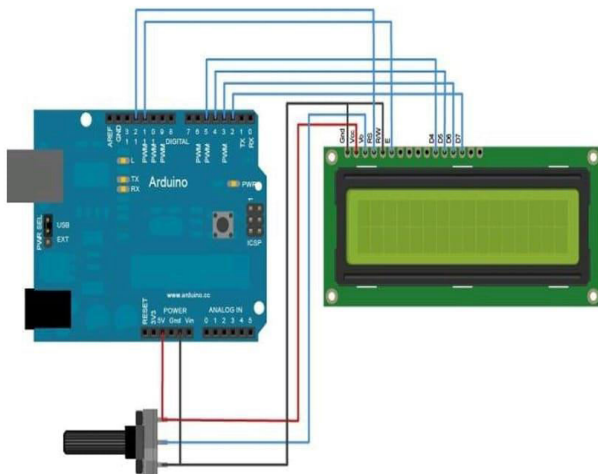


Figure 6-Interfacing Arduino Uno with LCD [6]

IV. SOFTWARE IMPLEMENTATION

The software used for the preparation of the project is Arduino IDE. In the open source software Arduino(IDE) it is easy to write the code and upload it to the board.

This software runs on Windows, Mac and Linux. This was the software to draft the final code for this project. The code is

written in C++ and is based on processing and other open source software.



Figure 7-Arduino

V. CIRCUIT DIAGRAM

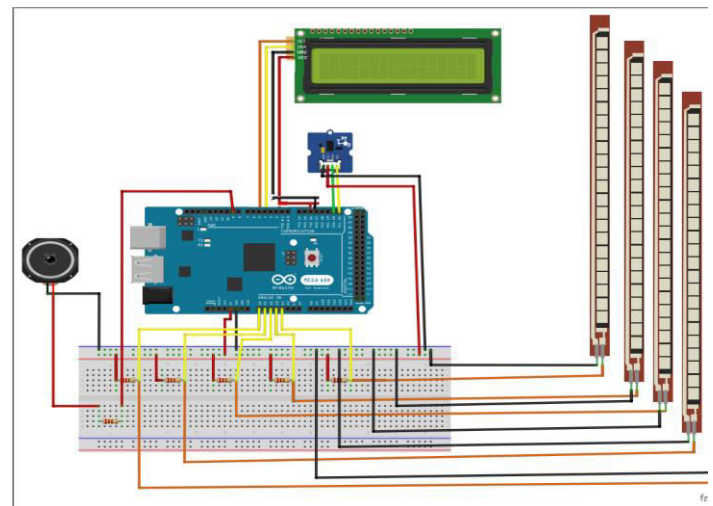


Figure 8-Circuit Diagram[4]

VI. REQUIREMENTS

- For Sensor board :-
 1. Flex sensors
 2. ADXL 335
 3. 10K ohms resistance
 4. small PCB
 5. Bug strips for connections
- Controller Section :-
 1. Arduino UNO
 2. Atmega 328p-pu
 3. 22p F Capacitors
 4. 16 MHz Crystal Oscillator
 5. 10K Ohms resistance
 6. Reset button
- Audio Processing and LCD unit
 1. Audio processor store and playback sound - APR 33A3

2. LCD to display message
3. Microphone to record audio message
4. Speaker 16 Ohms to play audio signal

VII. CONCLUSION

Hand Gesture vocalizer is a gesture based interface for reducing the communication gap and facilitating communication among normal people and people with speech, blind and hearing disabilities. In this a normal cloth glove is used which is fitted with flex sensors along the length of each finger and the thumb. A microcontroller and sensor based gesture to voice and display converter is created in this project. This can be helpful to recognize the commonly used gestures and convert them into the form voice message as well as a text message for the benefit of the blind, speech and hearing impaired persons.

A microcontroller based Hand Gesture Vocalizer system which makes use of flex sensors and an accelerometer for gesture detection and the tilt detection respectively, so with the help of this the input values which correspond to a particular gesture are then played as a voice message through a speaker as well as displayed as text on the LCD screen .

VIII. FUTURE ENHANCEMENTS

Hand Gesture Vocalizer is a social purpose project that helps people to uplift, who are speech, blind and hearing impaired, by facilitating them to have a better communication with the public. This system makes the communication among the dumb, deaf and blind communities and their communication with the normal people very easy.

Designing a wireless transceiver system for "Microcontroller and Sensors Based Gesture Vocalizer". Perfection in monitoring and sensing of the dynamic movements is involved in "Microcontroller and Sensors Based Gesture Vocalizer". Designing a jacket, which would be capable of vocalizing the gestures and movements of animals. Virtual reality application such as in videogames replacing the conventional input devices like joy sticks with the data glove. The Robot control system to regulate machine activity at remote sensitive places, tele-operators to perform surgeries with the help of expert surgeons remotely are another useful applications of such an implementation.

IX. REFERENCES

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