International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-9 Issue-2, December, 2019

Finger Gesture Vocalizer

Gagan Batra, A. Y. Prabhakar, Shruti K. Oza

Abstract*: A Gesture Vocalizer is a small scale or a large scale system that provides a way for dumb and mute people to communicate easily. The research paper defines a technique, Finger Gesture Vocalizer which includes sensors attached to the gloves above the fingers of the person who wants to communicate. The sensors are arranged in such a way on the gloves, that they can capture the movements of the fingers and based on the change in resistance of the sensors, it can be identified what the person wants to say. The message is displayed on the LCD and is also converted to audio using the APR33A3 audio processing unit. Standard sign languages such as that of American Sign Language which is used by dumb and mute people to communicate can be employed while wearing these gloves.

Keywords*: Atmega 328p-pu, audio processing unit, communication, gesture.

I. INTRODUCTION

Communication in today's world is an integral part of a human. The communication between vocally challenged people poses a much tedious task. They all over the world use standard sign languages to communicate with others. But this is not always possible because people need to take special training for it. Therefore people experience difficulties in understanding their reactions. To deal with these day to day issues, the Gesture Vocalizer system is developed. Whenever the system senses any gesture, it plays and displays the corresponding recording. The main motto of this model is to present a system that can convert the standard American Sign Language into text and audio. It helps by improving the communication of people with hearing disabilities. The project is based on the Atmega 328p-pu chip. The system is combined with a glove that works by sensing the hand movements when making gestures from the sign language, and then it recognizes the recorded data and is converted to audio and text for the LCD to display.

II. LITERATURE SURVEY

American Sign Language is the language used by most deaf and dumb people. It's very difficult for people from different regions to understand different languages. The grammar of American Sign Language is very different from English. Finger gesture uses only one hand and 26 gestures to communicate with people; however, there are a lot of signs that are used for communication. Lots of research work has been done in this field. One of them includes the use of hand gestures, which require the person to wear a glove which is fitted with sensors, audio processing unit, microcontroller, and other units to communicate. Other research work includes the use of pens or stylus to draw on a screen which can be further converted to speech or according to the need of the user.

III. METHODOLOGY

The Block diagram for understanding the modules is shown in Fig. 1. Various modules in the system are discussed below:

1) Digital Glove: A digital glove is nothing but a regular hand glove that is embedded with a flex sensor to the finger by threading or by using adhesive. This is done to help the sensors bend properly and to give an accurate voltage drop which can be sensed by the controller. The digital glove used in this system comprises of accelerometer and a flex sensor which is mounted on the finger of the digital glove.

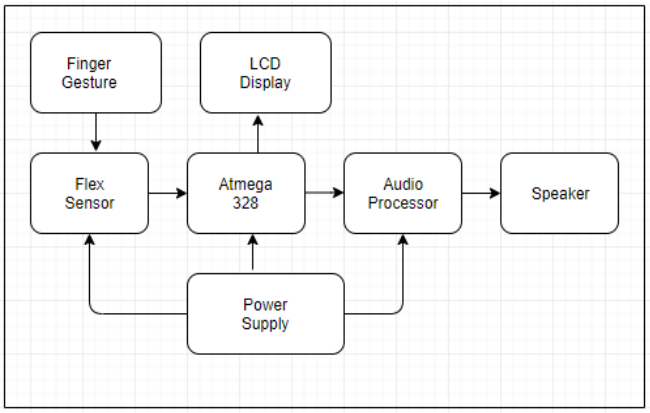

Fig. 1. Block diagram for Finger Gesture Vocalizer

2) Flex Sensor: The Flex Sensor is fitted on the thumb along with the finger of the digital glove to control & analyze the bending and tilting of the fingers. It is basically a sensor with an analog variable resistor that changes the resistance based upon the measure of bending in the flex. The output of the flex sensor is directly proportional to the bend provided by the sign. The result is then sent to the Atmega328p-pu chip in the operation where the same is executed & transformed into digital mode. The Incidence of this signal changes by the movement of the sensor.

Revised Manuscript Received on December 30, 2019.
* Correspondence Author
Gagan Batra*, E&TC Department, Bharati Vidyapeeth Deemed to be University, Pune, India. Email: batraga@mail.uc.edu
Salil Gupta, E&TC department, Bharati Vidyapeeth Deemed to be University, Pune, India. Email: salilgupta328@gmail.com
A. Y. Prabhakar, E&TC Department, Bharati Vidyapeeth Deemed to be University, Pune, India. Email: ayprabhakar@bvucoep.edu.in
Shruti K. Oza, E&TC Department, Bharati Vidyapeeth Deemed to be University, Pune, India. Email: skoza@bvucoep.edu.in

3)Accelerometer (ADXL335): An accelerometer is an electromechanical device that will measure the acceleration force. It is a complete 3-axis accelerometer with conditioned voltage outputs. An accelerometer is a sensor, which identifies the hand gestures by measuring the tilt made by the sensor. It analyzes the hand gestures and sends the detected data to the Gesture Detection component of the system. The result of the accelerometer is obtained by amplification in the form of analog signals and is passed on to the microcontroller.

4) Microcontroller (Atmega 328p-pu): This microcontroller chip takes the output of Accelerometer and generates an equivalent digital format by its A/D conversion. The microcontroller perform operations on the output obtained from the Analog to Digital Processing system (A/D) and compares with already stored values in the buffer of the microcontroller and based on these values, determines if the identified gestures have proper meaning or not and stores these meanings in primary memory. The data is then passed on to an audio processing unit. The LCD is interfaced with the microcontroller to display the message. Fig. 2 demonstrates the basic interface connections between the Atmega328 and APR33A3 which is the audio processing unit.

5) Audio Processing Unit (APR33A3): This unit gathers the data from the microcontroller and compares it with the values already stored in its memory, which was added by a separate mic. The compared values are then converted into audio and can be listened through the speaker.

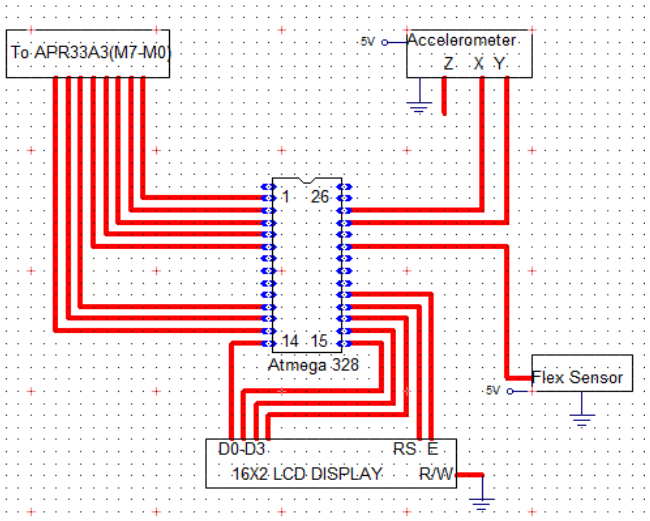

Fig. 2. APR33A3-ATMEGA Interface

IV. RESULT

In this model, the user forms a sign and holds it for a few seconds to make certain acknowledgment. The resulting signs were produced based on the resistance range produced by the sensors when the sensor is bent so as to make a gesture. The resistance values were mapped to different analog values and accordingly the output was generated, by checking the corresponding values to the output. Table I shows the corresponding values to the outputs. The arrangement is accomplished of recognizing signs more quickly than this sudden two seconds limit. Hence it is a low time-intense approach. Also, a real-time acknowledgment proportion of nearly 99% can be easily accomplished. This model was a sample to test the possibility of acknowledging ASL with the sensor. From this model, common people can easily understand the sign language of disabled people. The prototype made is presented in Fig. 3.

TABLE- I: Corresponding outputs to mapped values

Mapped Value	Corresponding outputs on LCD & by speaker
>= -9	“Sorry”
>= -15	“Hello”
>=-20	“Thank You”

Fig. 3. Hardware Implementation

V. CONCLUSION AND FUTURE SCOPE

This paper presents the design and working of the system using various modules and units together which when interfaced properly will be useful for deaf and dumb people to communicate. To implement more signs and gestures the system can be trained accordingly and perform the respective function of the gesture performed. By using this model we can minimize the constraints faced by the deaf, mute and physically paralyzed people.

Here are some future enhancements on which the research work can be done either to simplify the use of this system or to enhance the use in various fields:

1:- Scheming of wireless transceiver arrangement for “Microcontroller and Sensors Based Gesture Vocalizer”.

2:- Precision in controlling and sensing of the quick actions involved in “Microcontroller and Sensors Based Gesture Vocalizer”.

3:- Scheming of a skin, which would be trained in vocalizing the actions and movements of animals

4:- GSM connectivity can also be implied for several purposes.

REFERENCES

1. Instructables site, available at https://www.instructables.com/id/GESTURE-VOCALIZER-FOR-DEAF-DUMB-PEOPLE-INTERACTION/
2. Ata-Ur-Rehman, Salman Afghani, Muhhamad Akmal, Raheel Yousaf, "Microcontroller and Sensors Based Gesture Vocalizer", Proceedings of the 7th WSEAS International Conference on SIGNAL PROCESSING, ROBOTICS and AUTOMATION (ISPRA '08), University of Cambridge, UK, February 20-22, 2008.
3. Deepa Haridas, Drishya M, Reshma Johnson, Rose Simon, Sradha Mohan, Linu Babu P, "Gesture Vocalizer using IoT", International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering ISO 3297:2007 Certified Vol. 5, Issue 4, April 2017.

AUTHORS PROFILE

Gagan Batra, presently he is pursuing his masters from the University of Cincinnati, Ohio, US. He pursued his B.Tech from Bharati Vidyapeeth Deemed to be University, Pune, India in Electronics and Telecommunication.

A. Prabhakar, presently he is a professor in the Department of E&TC, Bharati Vidyapeeth Deemed to be University, Pune, India. He has done his M.Tech. in Industrial Process Instrumentation and has 4.5 years of teaching experience and has published 3 papers at national and international journals.

Shruti K. Oza, presently she is a professor and Head, Department of E&TC, Bharati Vidyapeeth Deemed to be University, Pune, India. She has done her M.Tech. and Ph.D. in VLSI Design. She has 17 years of teaching experience and has published 23 international journals and 40 national and international conferences.