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"Sign Language Translator"

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Abstract: **-** In this work, many ways of communications are used between human and computer, while using gesture is considered to be one of the most natural way in a virtual reality system. Because of its intuitiveness and its capability of helping the hearing impaired or speaking impaired, we develop a gesture recognition system. The Hand Talk glove is a normal, cloth driving glove fitted with flex sensors. The sensors output a stream of data that varies with degree of bend made by the fingers. Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to electrical resistance - the more the bend, the more the resistance value. The output from the sensor is converted to digital and processed by using ARM7 processor and then it responds in the voice using speaker.

Keywords: *speech impaired, hand signs, sensor glove, easy communication.*

I. INTRODUCTION

'Sign Language Translator' is a recognition system for the vocally disabled. We have turned to glove-based technique as it is more practical in gesture recognition which involves the use of specially designed sensor glove which produces a signal corresponding to the hand sign. As the performance of the glove is not affected by light, electric or magnetic fields or any other disturbance, the data that is generated is accurate. The processor analyses the signal and fetches the corresponding audio signal from the memory IC which is fed to the amplifier. The speaker generates the relevant sound. As the system uses the low cost and easily available sensors and IC's the system is very much cost effective.
In section 2 we discuss the overall system working, section 3 describes whole hardware setup. Result and analysis discussed in section 4.

II. SYSTEM DESCRIPTION

In this system microcontroller receives data from the glove, it consists of 4.2 inch flex sensors and gyro sensors. These sensors provide a corresponding signal of finger flexures and hand motion. ARM7 microprocessor contain 10-bit inbuilt ADC and use to receive the analog value from the sensor. An ADC converts analog to digital value and store the value in the buffer. Then Controller compares the static data and digital value for processing to determine the gesture. According to the finger movements microcontroller play the voice (speech). Voice is stored using APR6008 is a single chip used to store high quality voice recording and Non-volatile flash memory, playback capacity for 40 to 60 seconds. APR provides random and sequential multiple messages and designers can adjust storage time depends upon user needs. The chip integrated with microphone amplifier, Output amplifier. The six pins of APR use for voice storage and playback capability, each pin plays the voice for 60 second duration. The voice transmitter to receiver by the help of ZigBee and it also a portable device. The ZigBee used for long distance communication which are specifically designed for wireless speaker and earphone.

III. PROPOSED WORK

Data glove is implemented to capture the hand gestures of a user. The data glove is fitted with flex sensors along the length of each finger and the thumb. The flex sensors output a stream of data that varies with degree of bend.
Figure.1 illustrates the proposed system architecture; the system is mainly composed of several modules including the flex sensors, ARM 7 microcontroller, ZigBee, LCD, Audio amplifier and speaker. The first module (input) acquires signs performed by a dumb person communicating with the system using sign language; Flex sensors outputs data stream depending on the degree and amount of bend produced by the sign. A set of signs that represent words are collected as the data base for this system. The output data stream from the flex sensor is fed to ARM 7 Microcontroller where it is processed and converted into digital form. The analog outputs from the sensors are then fed to the inbuilt ADC of the ARM7 microcontroller. These analog readings are then digitized and stored in internal RAM memory of microcontroller. Then digitized readings are transmitted via

ZigBee to the receiving unit, which also contains the microcontroller which will compare these readings to the look up table stored in internal program memory, whichever reading is closest to the look up table microcontroller will select that word. That text will be displayed on LCD and played out via speaker. By using this wearable data gloves mute person can easily communicate with normal people.

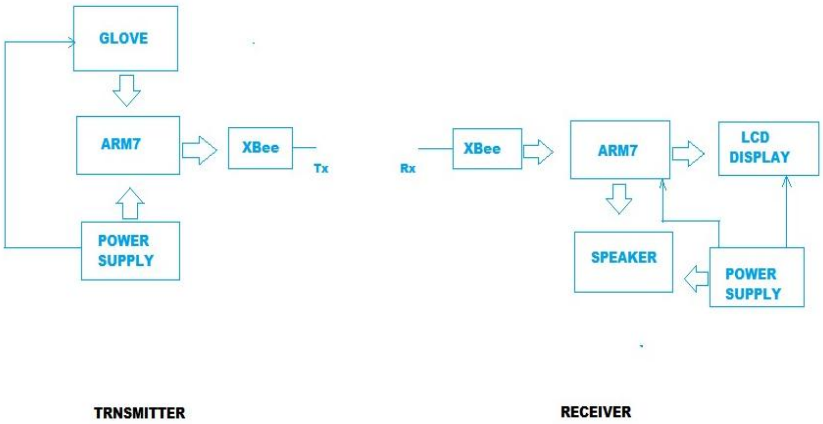

Fig. 1 Block Diagram of Sign Language Translator System

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Algorithm used:

• Stage 1: The data glove is fitted with flex sensors along the length of each finger and the thumb. The flex sensors output a stream of data that varies with degree of bend.

• Stage 2: Flex sensors outputs data stream depending on the degree and amount of bend produced by the sign.

A group of signs that represent words are collected as the data set for this system.

• Stage 3: The output data stream from the flex sensor is fed to ARM7 Microcontroller where it is processed and converted into digital form.

• Stage 4: The microcontroller will compare these readings to the look up table stored in internal program memory, whichever reading is closest to the look up table microcontroller will select that word.

• Stage 5: That text will be displayed on LCD and played out via speaker.

3.1. Flex Sensors

Flex Sensors are analog variable resistors, they works as variable analog voltage dividers. They are usually in the form of a thin strip having length 1"-5" width 0.25"and thickness upto 0.19", they can be made uni-directional or bi-directional, as the size changes according to that resistance varies. The Flex Sensors are mounted on each finger and thumb of the glove. These are fitted on the fingers by using threads and needle. Flex sensor basically made up of carbon resistive elements, which have greater form factor on a thin flexible substrate, more carbon means less resistance. 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. In this way flex sensor offers variable resistance readings.

Fig.2. Flex sensor.

Flex sensor operate at 5-volt input voltage d output between 0 and 5 V, resistivity varying with the sensor's degree of bend and the voltage output changing accordingly. The sensors connect to the device via three pin connectors. The flex sensor pictured below changes resistance when bent. It will only change, the resistance increases to 30- 40 kilo ohms at 90 degrees.

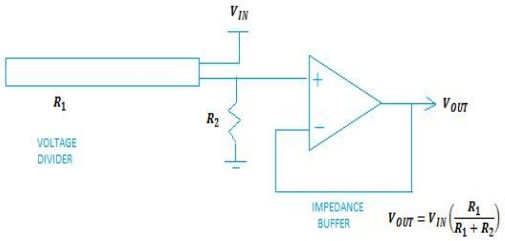

Fig.3. Circuit Diagram of Flex sensor.

Flex sensor basically consists of voltage divider circuit and the buffer as shown in above circuit diagram. The outputs from the flex sensors are inputted into non inverting style op-amps to amplify their voltage. The greater the degree of bending the lower the output voltage. Using the voltage divider concept the output voltage is determined and it ranges from 1.35v to 2.5v. A potentiometer can be added to the Circuit to adjust the sensitivity range. In this way you can use the flex sensor as a switch without going through a microcontroller. Resistance to Voltage Converter - use the sensor as the input of a resistance to voltage converter using a dual sided supply op-amp.

IV. RESULT

For the real time viewing we used Hyperterminal, on which we can see the change in each flex sensors value on bending finger. We can see the resistance variation of each finger in fig.4 and 5.

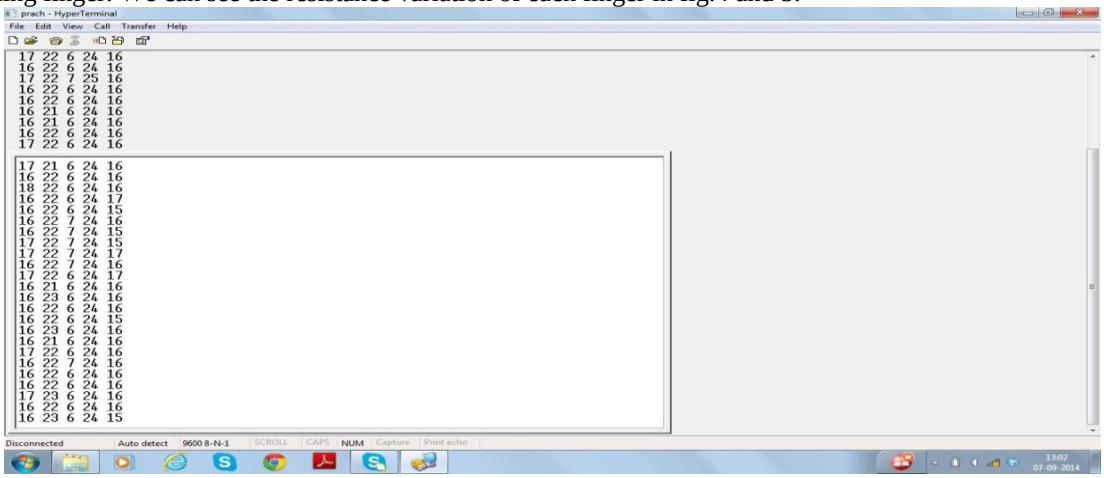

Fig.4. Steady state of Glove.

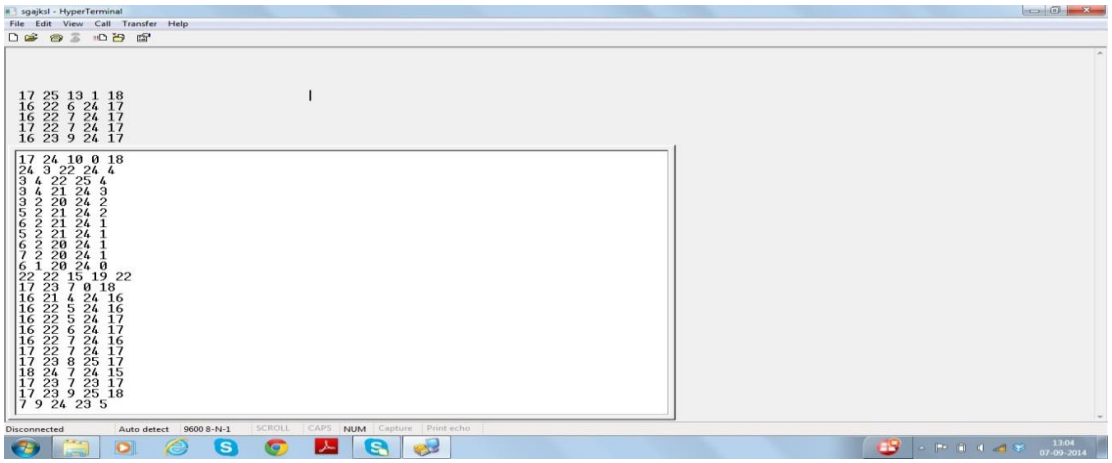

Fig.5. Working Glove.

V. CONCLUSION

In this project we are going to make a electronic speaking glove, by simply wearing that data glove mute person can easily communicate with the normal people. In this system LCD display is also used, after sign recognition the recognized word will be displayed as text on LCD display so it becomes easy for mute person to communicate with deaf person. In this way this project will help to lower the communication gap between mute, deaf and normal people. While making the system we should consider certain performance measures these are recognition time and recognition accuracy. The user should forms a sign and holds it for two seconds to ensure recognition. The system should be capable of recognizing signs more quickly than this arbitrary two seconds limit.

Advantages: Low cost, compact systems, flexible to users, takes less power to operate system.

Applications: Gesture recognition and conversion, a translating device for Mute people, can be used for Mobiles for SMS sending, translation of sign language in many regional languages.

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