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Hand-talk Gloves with Flex Sensor: A Review

AmbikaGujrati[1], Kartigya Singh[2], Khushboo[3],
Lovika Soral[4], Mrs. Ambikapathy[5]

ABSTRACT: In general, deaf people have difficulty in communicating with others who do not understand sign language. Even those who do speak aloud typically have a "deaf voice" of which they are self-conscious and that can make them reticent. 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 microcontroller and then it responds in the voice using speaker. In this project we have used a microcontroller, a speech IC and also speaker to produce the output. Hardware Components used are Microcontroller (AT89S52), LCD display (16x2), flex sensors, Power supply and Voice IC (APR 9600). Software used is Kiel U vision, Embedded 'C', Express PCB and ISP. It is used in medical applications, wheel chair direction controlling and robotics.

I. INTRODUCTION

I.1 LITERATURE REVIEW

The first Hand Talk glove was designed by Ryan Patterson in the year 2001. He began his mission with his Sign Language. Sign Language Translator consists of two separate components, a leather golf glove that has ten flexible sensors sewn into it which monitor the position of the fingers by measuring the electrical resistance created by the fingers as they bend. A small microcontroller on the back of the hand converts the change in the electrical current into digital signals and transmits them wireless to a computer. The computer then reads the numerical values and converts them into the letters which appear on the screen. The main disadvantage with this model was that a computer or a laptop was always required for its functioning which made it less portable.

II. METHODOLOGY

A group of engineering students at Carnegie Mellon University, Bhargav Bhat, Hemant Sikaria, Jorge L. Meza and Wesley Jin demonstrated their project 'Hand Talk' a sensor equipped glove that translates finger and hand gestures into spoken words. This is the first demonstrator model to show the functionality based on a limited vocabulary of 32 words. Sensors in the glove pick up gestures and transmit the data wirelessly via Bluetooth to a cell phone which runs Text to Speech software. The sensor data are converted first into text and then to voice output. A person not knowledgeable in Sign language can listen via the cell phone what the other person is saying in Sign language form. The main advantage with this design was its simplicity and the cheap components these students used to create this amazing and truly interactive glove that could help to improve greatly the communication barrier between deaf persons and people.

III. FINDINGS AND DISCUSSIONS

The latest sensor being used for the Hand Talk glove is the accelerometer. Instead of working in two planes (X and Y) like in the flex sensors, it works in X-Y, Y-Z and X-Z planes. It is more reliable than the flex sensors and only one accelerometer is required for one glove. More number of programs can be fed into it so it can accommodate more number of sounds in it.

In power supply circuit the DC pulsating is removed by electrolyte capacitor (1000 µF) and the noise generated is removed by ceramic capacitors. Our hardware requires 5V DC and hence a voltage regulator of 7800 series (7805) is used. LED's are used which informs about the supply being activated. A 330Ω resistor is used to drop the voltage and make it 2-2.5V as required by the LED. The deflection of the flex with a minimum angle of 40°, a resistance is obtained which is increased by bending and voltage is obtained. Four flex sensors along with their connection ports are placed. The voltage is in milivolts and so we use op-amp (LM358) to amplify it. The op-amp used is a non inverting type with high voltage gain. Rf resistor is variable resistor with (0-10)kΩ and Ri is 2.2kΩ. A 33k resistor is used at the output of op-amp which stops the voltage from being grounded. PIC16F877 a peripheral interface controller is used with flash memory 8kb and an inbuilt ADC converter with 10 bit resolution. The microcontroller converts the analog output into digital and provides a high and low voltage. A crystal oscillator with 12MHz is used which provides the microcontroller with frequency clock pulse. Two 33pF capacitors are used along with the oscillator. The high or low voltage is then passed to an NPN transistor which gives the output which is further sent to relays. Relays used have internal magnetic field. They act as an ON-OFF switch. One relay acts as play button and the other as forward , for the 3rd flex sensor to act the forward relay will be forwarded 2 times and then played and similarly others will operate. The message is now forwarded to voice recorder ISD1720 which has mike and speaker connected to it. Electrolytic and ceramic capacitors are used which removes the ripples and cancels noise. An RF circuit is used which provides automatic gain control which gives constant output. The voice can be recorded through mike and according to the flex deflected the output is received from loudspeaker.

IV. SIMULATION DIAGRAM

Signal produce by strain gauge are translated by microcontroller Arduino Uno into digital form and through serial communication transferring the data to Matlab software. This Simulink diagram is basic setting to establish connection between microcontroller and computer with Matlab software install. Arduino IO library must be pre-install in Matlab, while programming for serial communication is integrate into Arduino UNO. COM9 is location of Arduino connect to USB ports while gain block is calculation for conversion value from Arduino pin via serial port into corresponding voltage references. Gain block is block that multiplies input data by a constant value (gain) as shown in Figure 3. Figure shows the unfiltered data from GloveMAPbending activities for Index and Middle finger at a range of 0º, 45º and 90º.

V. CIRCUIT DAIGRAM

This circuit diagram shows the capability to measure or translate 7 potentials sign language “Word A, B, C, D, F, K and number 8”. Each letter or word that is translated by the translator will be displayed on the screen and the displayed symbol will make it easier for those who are not disabled to understand what the deaf or mute wanted to deliver during the communication session.

VI. APPLICATIONS

It can be used for computer gaming. It is loaded with touch sensors on the thumb, the fingers and the palm. It allows the wearer to forego using the keyboard. Another application can be in the field of fire extinguishing by fire extinguishers in a situation where members of a team can’t even see each other; these gloves will be able to transmit signals via simple hand gestures. The gloves have symbols on them that light up according to the signal received.

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VII. CONCLUSION

Instead of using a computer or a cell phone as used in the earlier inventions, we are using the microcontroller. It makes this easily portable and easier to use. Even though the less advanced flex sensors are used, still a large number of sounds can be pre-recorded in the recorder and can be used through the programming. The flex sensors working in the two planes provide a lot of options for movement of the fingers and the thumb which is later transmitted into voice. It can be seen from figures 5 and 6 that using simulation techniques that the clarity of the signals can be improved.

REFERENCES

[1]. G. R. Karlan, “Manual communication with those who can hear,” in Manual

[2]. Communication: Implications for Education, H. Bornstein, Ed., pp. 151–185, Gallaudet

[3]. University Press, Washington, DC, USA,

[4]. 1990.

[5]. K. Ellis and K. Blashki, “Children, Australian sign language and the web; the possibilities,” pp. 281-287.

[6]. Infusion Systems, “Infusion systems,” June, 2012, www.Infusionsystems.com.

[7]. Stokoe, William C. "Dictionary of American Sign Language on Linguistic Principles", Linstok Press. ISBN 0-932130 011,1976.

[8]. Stokoe, William C. "Sign language structure: An outline of the visual communication systems of the American deaf", Studies in linguistics: Occasional papers (No. 8). Buffalo: Dept. of Anthropology and Linguistics, University at Buffalo, 1960.

[9]. Ninja P Oess, Johann Wanek and Armin Curt, "Design and evaluation of a low-cost instrumented glove for hand function assessment", Journal of Neuro Engineering and Rehabilitation 2012, 9:2

IX. FIGURES

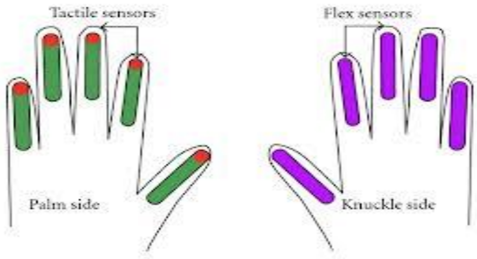


Figure 1:How flex and tactile sensors were distributed across the gloves

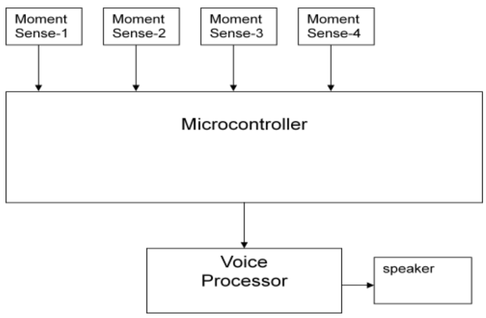
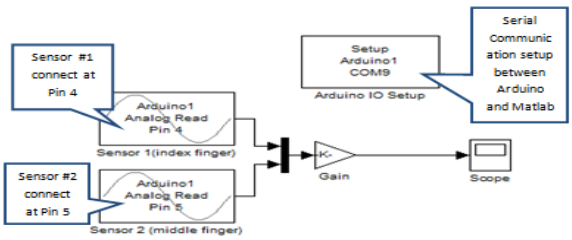


Figure 2: Block Diagram



2.1: Simulation Daigram

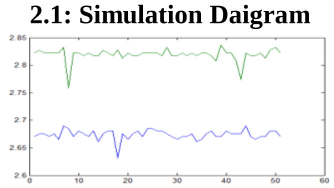


Figure 2.1.1: Unfiltered data for 0 degree

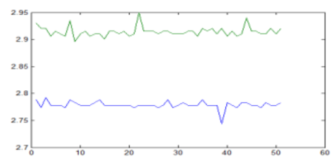


Figure 2.1.2: Unfiltered data for 45 degree

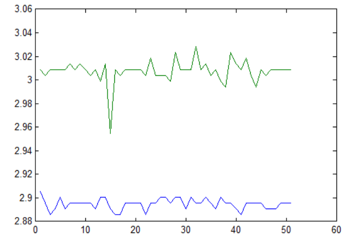


Figure 2.2.3: Unfiltered data for 90 degree

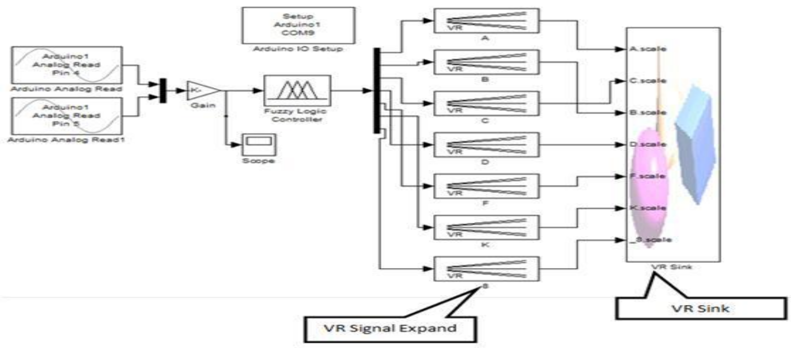


Fig 2.2: Commercial finger motion glove-Fuzzy Logic of Eight Symbols of Sign Language

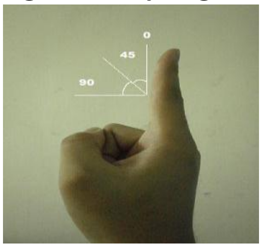


Figure 2.2.1

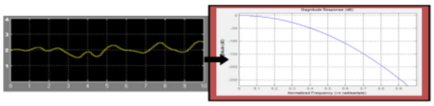


Figure 3.1: Sampled data for 0 degree

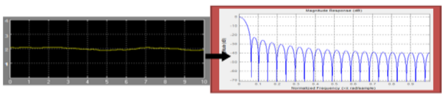


Figure 6.2: Sampled data for 45 degrees

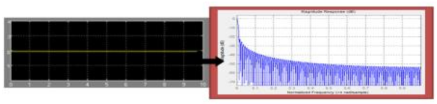


Figure 6.3: Sampled data for 90 degrees