Communication Interface for Mute and Hearing Impaired People

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***Abstract* - Sign language is an important tool used by the mute and hearing impaired people to communicate. To ensure seamless interaction between hearing impaired /mute people and society without translator understanding of sign language by one and all is must. To overcome this limitation, desire to develop human machine interface that recognize the sign language would have a significant impact on deaf and mute people's social life. In the proposed work, state of art interface has been demonstrated which recognizes the sign language through flex sensors and to convert it into text and voice. The system employs PIC16f887,APR 9600andflexes sensors. The simulation part has been done using Proteus and hardware is developed accordingly. The system has been tested for various signs and optimum results have been obtained.**

Keywords: embedded system, flex sensors, Proteus,

Voice Module

I. INTRODUCTION

To ensure seamless interaction between hearing impaired /mute people and society without translator understanding of sign language by one and all is must. In order to lower this barrier designing human machine interface has drawn a great attention towards its field of research. Enormous work has been reported so far introducing various aids to convert sign language text and voice message. Some of prominent solutions include B-Spline approximation, Real Time Continuous Gesture recognition (RTC), Motion Tracking Network (MTN), etc. B-spline[1] is a Vision-based recognition system for Indian sign language alphabets and numerals. Algorithm approximates the boundary extracted from the region of interest, to a B-Spline curve by taking the maximum curvature points (MCPs) as the control points. A very Large vocabulary sign language interpreter is presented with real-time continuous gesture recognition of sign language using a data glove. End-point detection in a stream of gesture input is first solved and then statistical analysis is done according to 4 parameters in a gesture: posture, position, orientation, and motion. The recognition percentage is very less and is below 90%[2]. Technology for hand gesture recognition which is based on thinning of segmented image. System works suitably for static letters of the American Sign Language. The drawback of this system was that it does not give good results under thepoor background light conditions [3].SLARTI for data acquisition it uses a robotic glove and a system based on magnetic fields. Implementation cost is very high.University of Central Florida gesture recognition system uses a webcam and computer vision techniques to collect the data and a neural network to classify shapes [4]. For recognition, this system requires wearing a specially colored glove to facilitate the imaging process.ASLR [5] uses a webcam and computer vision techniques to collect field data and for classification of signs. Many of these developments have been made but there are several sections to be explored so as to make system more simple user friendly and economic. Keeping in view the practical implementation and considering the need of challenges in designing machine interface to decode sign language , an effort has been put in to design the prominent finding for the literature regarding human machine interface are stated specifying the scope of improvement in these findings.

Section1:Describe the simulation of prospered work. The result obtainedthrough simulation was satisfactory enough for initiation hardware design.

Section 2:Describes the detailed description of hardware design followed by result obtained and possible improvement in prospered work

II. DESIGN DEVELOPMENT AND FABRICATION

Section 1

Prior to hardware design the network was simulated through Proteus ISIS 7.6.8741. This simulation software provides professional tools for simulating embedded system.

Figure 1 shows the flex sensor is modelled through a variable resistor and is given as the input to the Pic micro controller and corresponding output is shown on lcd.

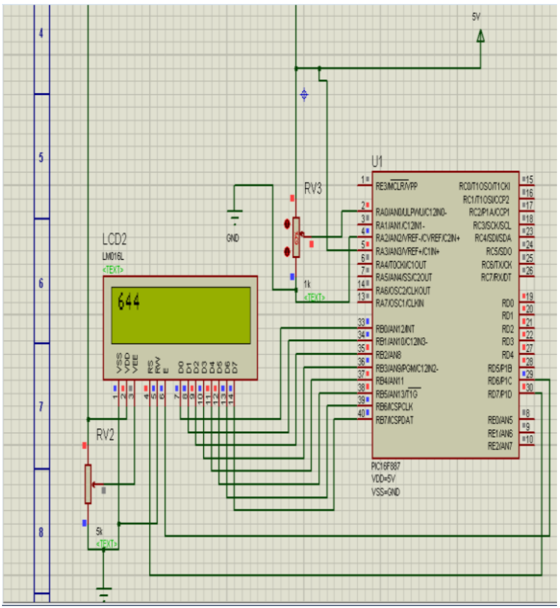

Figure 1: simulation of the desired hardware design using the Proteus.

For experimental setup, design flow and block diagram is shown in figure 2 and figure 3 respectively.

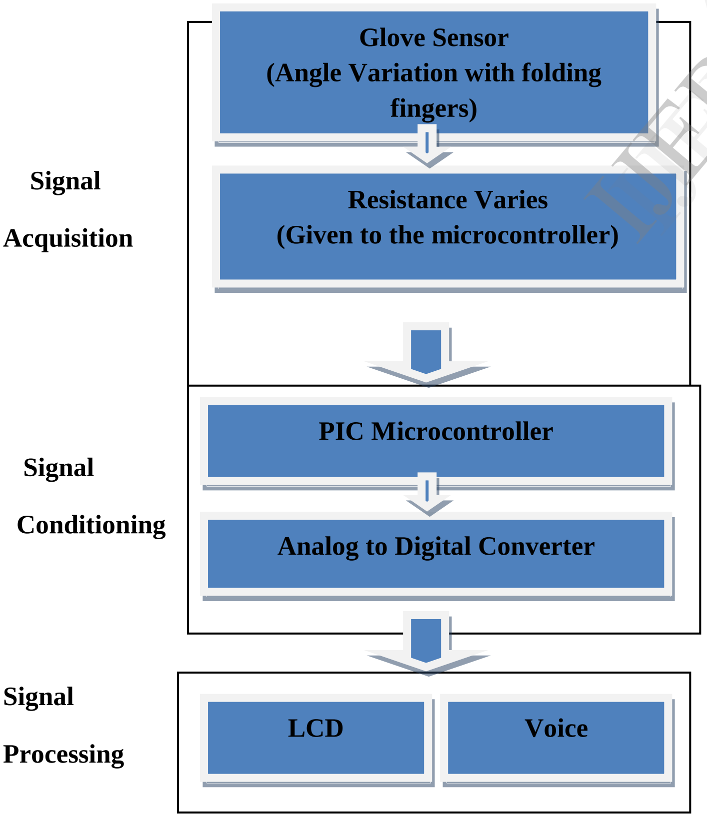

Figure 2: Design flow

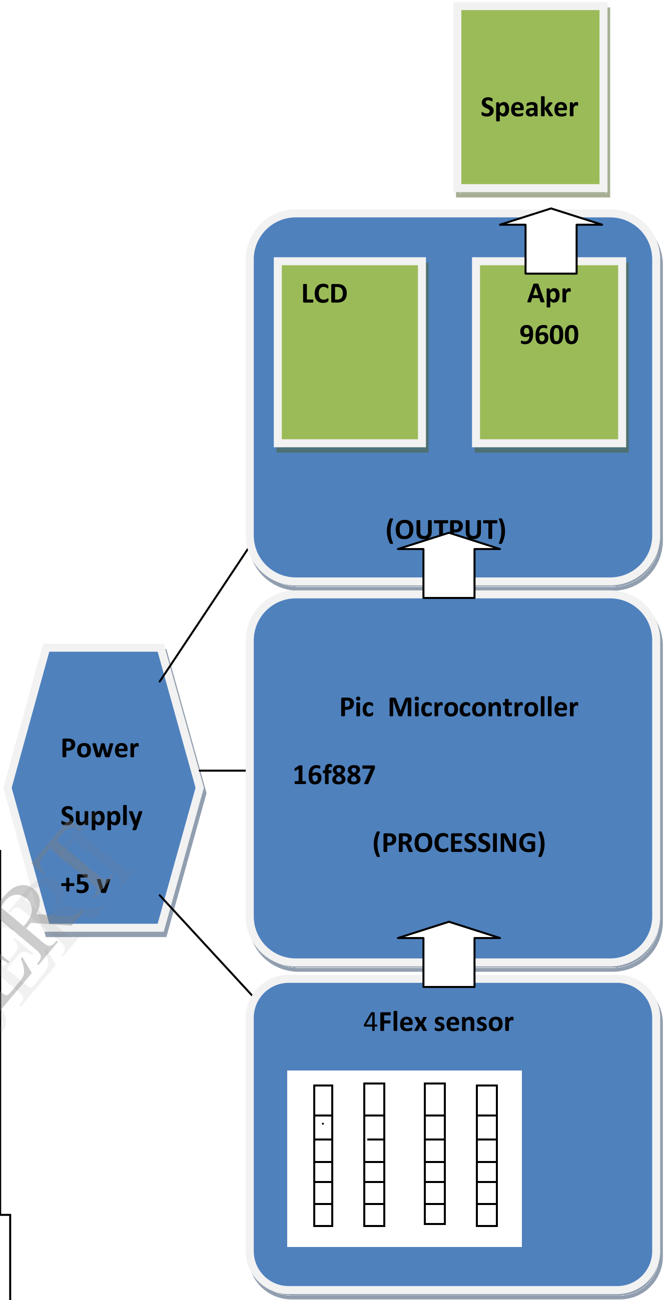

Figure3: Block diagram

Section 2

Major Component used in hardware design are flex sensors, Pic microcontroller 16f887, Apr 9600,lcd (16*2). Figure 4 shows the complete hardware setup with the no symbol detected on the lcd display.

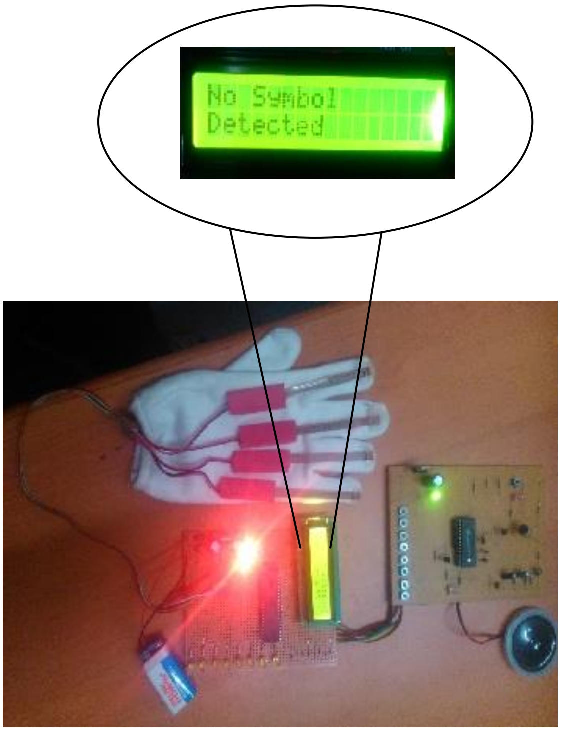

Figure 4: Hardware Setup

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The input is provided from the flex sensor which converts the resistance change in bend to electrical resistance the more the bend more the resistance value. A bridge circuit is implemented by using a 10 k ohm sensor in series with flex sensor. Figure 5 shows voltage divider rule being applied on the flex sensors and the output voltage is given to ADC channels of Pic micro controller. The output voltage is given by

Vout=Vin(R1/R1+R2)

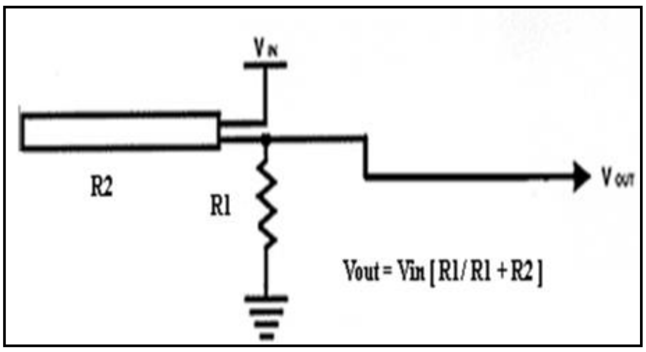

Figure 5: Working of flex

The output voltage is converted into digital through pic 16f887 which has 10 inbuilt analog to digital convertor channels.Figure 6 shows the variation in resistance due to the bending of the flex sensor using the multimeter.

Figure 6: Snapshot of Change in Resistance with Bending of flex sensor

Table 1 shows that due to bending of the flex sensor (in degree) the change in the resistance value of the flex sensor with the corresponding output voltage .

DEGREE	RESISTANCE (kilo ohms)	VOLTAGE (ANALOG)
0	10.536	2.5
10	12.832	2.27
20	14.124	2.08
30	15.572	2.01
45	18.000	1.78
60	22.686	1.56
75	26.296	1.38
90	30.460	1.25

Table1:Degree resistance voltage with bending of flex sensor

III. RESULT AND CONCLUSION

The table 2 shows the different position of the 4 flex sensors and their corresponding outputs on the lcd in text and voice through APR 9600.

Flex 1 degree	Flex 2 degree	Flex 3 degree	Flex 4 degree	Text	Voice
0	Above 90	Above 90	0	Why	Why
Above 90	Above 90	Above 90	Above 90	Yes	Yes
0	0	Above 90	0	Hello	Hello
0	0	Above 90	Above 90	Who	Who
0	Above 90	0	0	No	No
Above 90	0	0	Above 90	Bye	Bye

Table 2: Position of sensors and corresponding output onlcd and APR 9600.

To check the reliability and accuracy of system testing has been done by providing 25 samples in random order a few has been shown below.

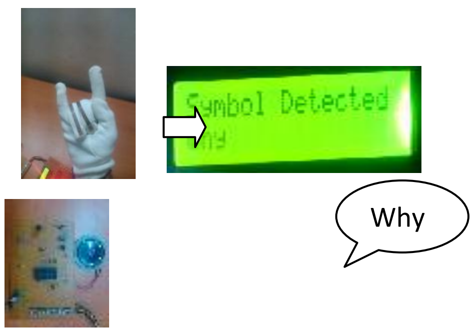

Figure 7: Samples taken in random order

The proposed system aims to lower the communication gap between the hearing-impaired or mute community and the normal world. This project was meant to be a prototype to check the feasibility of recognizing sign language using sensor gloves. With this project the hearing-impaired and mute people can use the gloves to perform sign language and it will be converted in to speech so that normal people can easily understand. The main feature of this project is that the gesture recognizer is a standalone system, which is applicable in daily life.Data gloves can only capture the bending of fingers and not the shape or motion of other parts of the body example arm, elbows, face etc. So only postures are taken and moving gestures are ignored. The problem of recognizing moving gestures can be resolved using 3 axis accelerometer sensor at wrist for full capture of the wrist movement changes, while 2axis accelerometer can be used at elbow and shoulder.

IV. FUTURE WORK

The completion of this prototype suggests that sensor gloves can be used for partial sign language recognition. More sensors can be employed to recognize full sign language. A handy and portable hardware device with building translating system and group of body sensors along with the pair of data gloves can be manufactured so that a hearing-impaired and mute person can communicate to any normal person anywhere.

V. REFERENCES

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