International Journal of Scientific Research and Management Studies (IJSRMS)
ISSN: 2349-3771 **Volume 3 Issue 1, pg: 61-67**

GESTURE VOCALIZER USING PIC AND LM339N

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ABSTRACT

It is based on the need of developing an electronic device that can translate finger gesture into speech in order to make the communication take place between the mute communities with the general public possible. A data gloves is used which is normal cloth driving gloves fitted with flex sensors along the length of each finger. Mute people can use the gloves to perform hand gesture and it will be converted into speech so that normal people can understand their expression. This device contains a set of 4 flex sensors which are required to give data as input resistance to the microcontroller according to the bending of flex sensors, this resistance is converted into display through a 16 BIT LCD display on which the person on the other side with normal abilities can easily read the converted message or if the person is blind can listen the converted message from the speaker or earphones through voice recording and playback device based on APR 33A3 IC. This project can help people in general ways as well as can be used as biomedical instrument in hospitals wards like intensive care unit or operation theatres.

KEYWORDS: PIC *16F877A, APR33A3, Flex sensors, LCD, LM339N.*

I. INTRODUCTION

Sign language is a language which, instead of acoustically conveyed sound patterns, uses manual communication and body language to convey meaning. This can involve simultaneously combining hand shapes, orientation and movement of the hands, arms or body, and facial expressions to fluidly express a speaker's thoughts. Wherever communities of deaf people exist, sign language will be useful. Sign language is also used by persons who can hear, but cannot physically speak. While they utilize space for grammar in a way that spoken languages do not. Sign languages exhibit the same linguistic properties and use the same language faculty as spoken languages do. Hundreds of sign languages are in use around the world and are at the cores of local deaf cultures. Some sign languages have obtained some form of legal recognition, while others have no status at all. Deaf and dumb people use sign language to communicate with themselves and with common people. It is very difficult for the common people to understand this language. Though they can show their message in writing, it is not conveyable to the illiterate people. Sign language translating equipments helps in conveying their message to the common people. It translates their message in sign form to the normal understandable text or voice form. Our project is one such effort in developing a glove which senses the hand movement of the sign language through sensors and translates it into text and voice output. All over the world there are many deaf and dumb people. They are all facing the problem of communication. In order to overcome this communication barrier, we are developing a device which translates their sign language into voice form. As shown in Fig 1.

In the first section we mentioned Introduction of the paper, in the second section we mentioned about the theory of the topic. In the third section we mentioned about design methodology of the circuitry for the research and in fourth section we mentioned the result and discussion made after the successful implementation of design .In the last section conclusion of the paper is given.

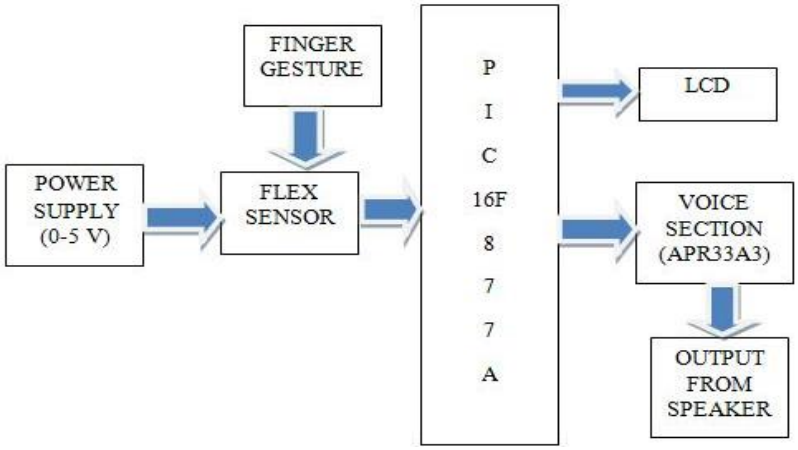

Fig 1-Block Diagram of Gesture Vocalizer

II. THEORY

In this circuit diagram, power supply is given by microcontroller 7805 which maximum can give 5 volt. Here variable resistor is in parallel with flex sensor which again has the resistance of 10 ohm. On bending it changes its resistance and it increases. It has 8 Led's which is in parallel to voice processor and in series with LCD so that we get to know that board is taking response or not. Now in PIC16F887A pin 2, 3, 4, and 5 have inbuilt ADCs which are directly connected to flex sensor. LCD is connected to port D of PIC and voice processor is connected to port C. It has a RESET button which is only used to execute the program from the starting. First of all we record all the messages according to the programming stored in the microcontroller. There are 8 messages can be recorded in APR33A3 VRPB board which will total time in 680 sec. according to the number of messages we want to record we have to set the jumper wire connections in the VRPB board. Then we plug the VRPB board through AC adapter and connect 8 port from M1-M8 to the main circuit board.th main board power supply is given through a 9V battery. As the resistance increases after bending the flex sensor attached fingers the comparator ic detects the signal as high and the corresponding finger led glows which shows the input is detected by the main board. The controller according to the input gives output to the LCD display as well as to the VRPB board. As shown in Fig 2.

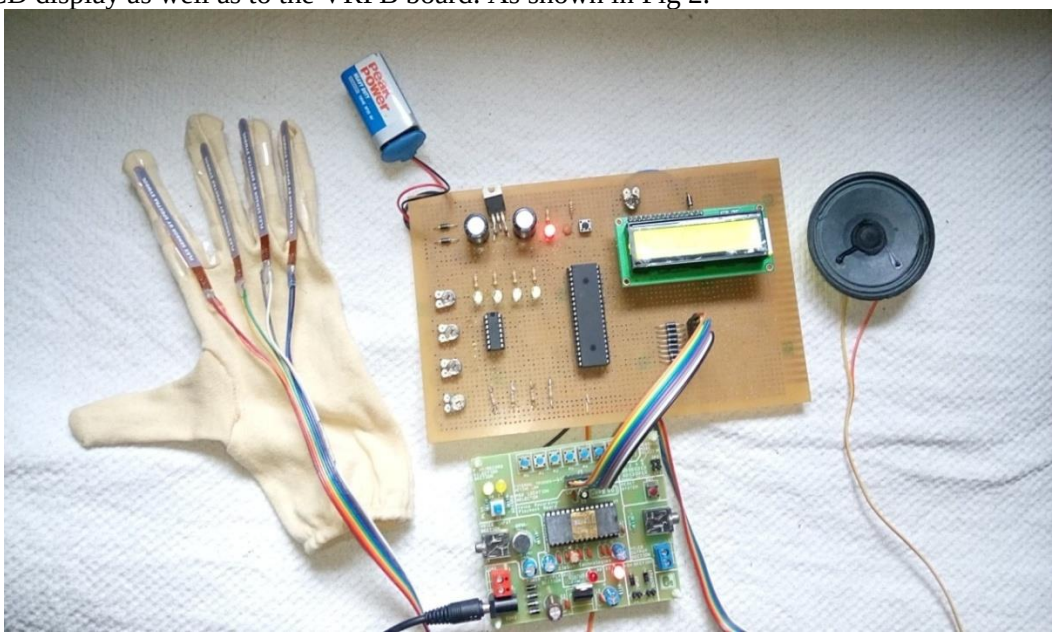

Fig 2- Gesture Vocalizer Using PIC andLM339Nin Working Condition

III. DESIGN METHODOLOGY

Designing of gesture vocalizer with PIC and LM339N is device which is based on digital and analog electronics both the whole circuitry works on analog circuitry but the flex input circuitry is made on digital electronics basic of binary input 0 or 1 with the help of LM339N IC which compares the input of flex sensor as 0 or 1.(shown in Fig 3)

- Microcontroller- Microcontroller is a heart of sign translator, which takes the input from the sensors and this sensing data, is compared with the instructions fed in the microcontroller. The programming of this device is done in C language. If sensors data is matched with the instructions then voice is produced from the voice section according to the sign made by the user otherwise user have to make sign again. As shown in Fig 4.

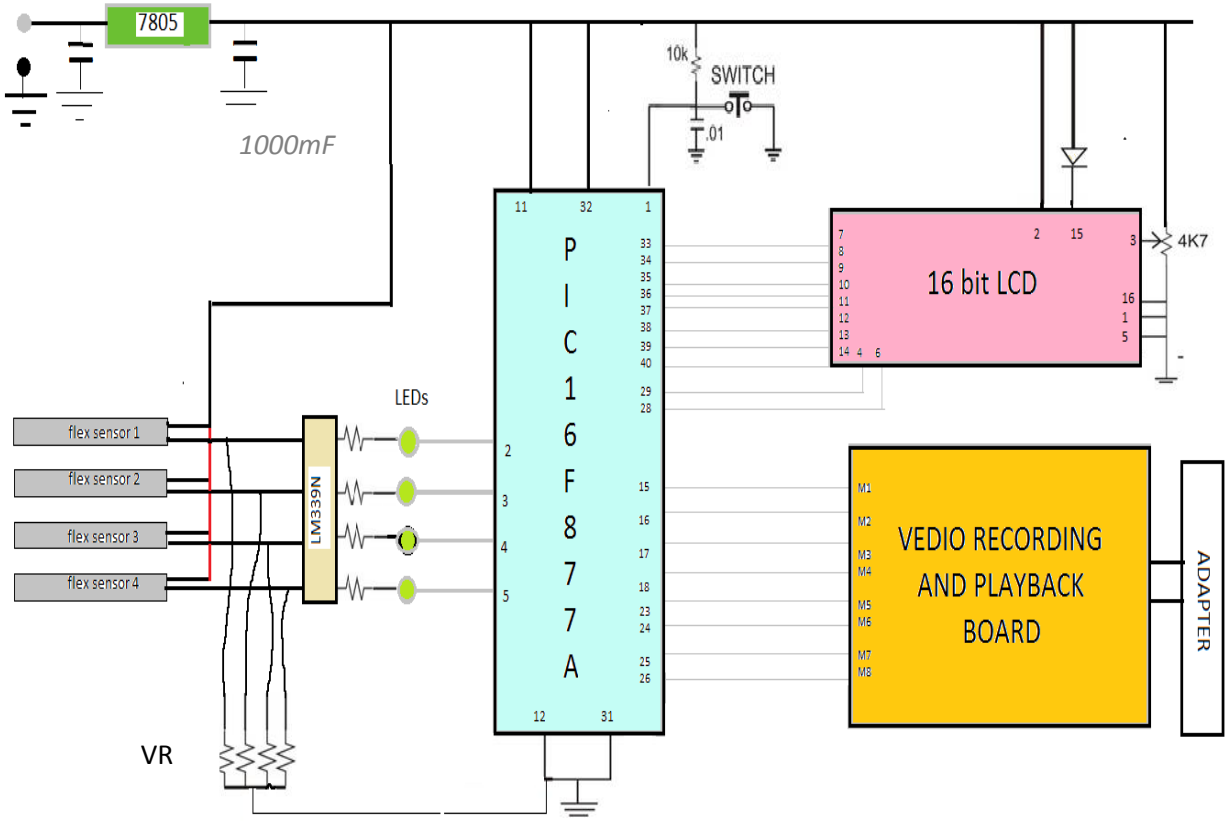

Fig 3- Circuit of PIC andLM339N Based Gesture Vocalizer

Table 1- Pin Connections of Pic 16F877A

PIN NUMBER	PIN NAME	CONNECTION
1	Vpp	HIGH VOLTAGE
2	AN0	FLEX 1
3	AN1	FLEX 2
4	AN2/Vref	FLEX 3
5	AN4/Vref	FLEX 4
6	C1OUT	NC
7	C2OUT	NC
8	AN5/RD	NC
9	AN6/WR	NC
10	AN7/CS	NC
11	Vdd	HIGH VOLTAGE
12	Vss	GROUND
13	CLKIN	NC
14	CLKOUT	NC
15	RC0/T1OSO/T1CKI	M1

16	RC1/T1OSI/CCP2	M2
17	RC2/CCP1	M3
18	RC3/SCL	M4
19	RD0/PSP0	NC
20	RD1/PSP1	NC
21	RD2/PSP2	NC
22	RD3/PSP3	NC
23	RC4/SD1	M5
24	RC5/SD0	M6
25	RC6/TX	M7
26	RC7/RX	M8
27	RD4/PSP4	NC
28	RD5/PSP5	LCD 6
29	RD6/PSP6	LCD 4
30	RD7/PSP7	NC
31	Vss	GROUND
32	Vdd	HIGH VOLTAGE
33	RB0/INT	LCD 7
34	RB1	LCD 8
35	RB2	LCD 9
36	RB3/PGM	LCD 10
37	RB4	LCD 11
38	RB5	LCD 12
39	RB6/PGC	LCD 13
40	RB7/PGD	LCD 14

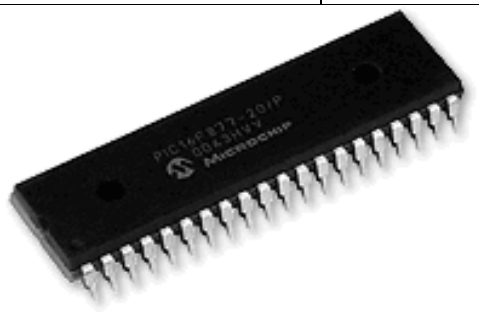

Fig 4- Microchip Pic 16f877a Microcontroller IC

Flex Sensor- Flex sensor is a sensor which respond on bending. Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor. Flex sensor is a sensor which responds on bending. Flex sensor requires an input of 5V and output will be produced between 0-5V, the resistivity varying with the sensor's degree of bend and the voltage output changing accordingly. The sensors connect to the device via two pin connectors (As shown in Fig 5).
The device can activate the sensors from sleep mode, enabling them to power down when not in use and greatly decreasing power consumption. Flex sensor attached to the glove using needle and thread. Flex sensor is made up of carbon resistive material within thin flexible substrate, more carbon means less resistance. Flex sensor consists four layers in its structure

Fig 5- Unidirectional Flex Sensor (2.5 Inches)

- Voice Recording and Playback board- In this section pre-recorded voice for the corresponding sign made by the user is played by the speaker, when that particular sign is matched with the recorded sound.

Table 2- Pin Connections of APR33A3

Pin Name	Pin No.	Type	Description
VDDP VDD VDDA VDDL	8 10 18 24		Positive Power Supply
VSSP VSSL VSSA	5 11 17		Power Ground
V_{LDO}	25		Internal LDO output
V_{CORE}	16		Positive Power Supply for core
V_{REF}	19		Reference voltage
V_{CM}	20		Common mode voltage
Rosc	26	Input	Oscillator resistor input
RSTB	27	Input	Reset (low active).
SRSTB	28	Input	System Reset (pull down a resistor to VSSL)
MIC^+ MIC^-	21 22	Input	Microphone Differential Input
MICG	23	Output	Microphone Ground
VOUT2 VOUT1	6 7	Output	PWM Output to drive speaker directly.
REC	12	Input	Record Mode (Low active)
M0 M1 M2 M3 M4 M5 M6/ $M_{SEL}0$ M7/$M_{SEL}1$	13 14 15 9 3 4 1 2	Input	Message-1 Message-2 Message-3 Message-4 Message-5 Message-6 Message-7 Message-8

- LCD- Liquid Crystal Display is used to display the important information or the recorded voice in the form of text. As shown in Fig 6.

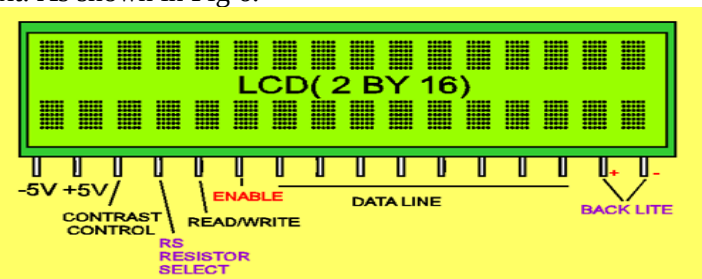

Fig 6-LCD Display with Pin

IV. RESULTS AND DISCUSSION

Table 3- Results According To 4 Flex Sensor Input

Digital equivalent value of the flex sensor bending	Message playback
x1<500 && x2>600 && x3>600&& x4>600	Message 1*(HELLO)*
x1>600 && x2<500 && x3>600 && x4>600	Message 2*(WANTED WATER)*
x1>600 && x2>600 && x3<500&& x4>600	Message 3 *(CALL THE NURSE)*
x1>600 && x2>600 &&x2>600&& x4<500	Message 4*(HOW ARE YOU)*
x1<500 && x2<500 && x3>600&& x4>600	Message 5 *(I'M FINE)*
x1>600 && x2>600 && x3>600&& x4>600	Message 6 *(TOILET)*

Fig 7(a) & (b) - Showing results at message M2 and M4

By displaying the message on LCD display(as shown in fig 7(a) &(b)), one can easily convert his gesture into a language which is easily readable by the other this will help the patients to easily convey their message without any problem.

V. CONCLUSION

- 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.
- As it is a compact device but can also be more compacted through embedded circuitry.
- In this project we assigned 7 different basic need messages need for a dumb or ICU patient during his/her treatment.

VI. FUTURE ASPECTS

- The following project can also be converted into wireless mode, by just adding RF transmitter and receiver
- Can also be modified for long distance communication in big hospitals via GSM.
- Can also be used for the Robot control system to regulate machine activity at remote sensitive sites.

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