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A Sign Language To Text Or Speech For Deaf And Dumb

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Abstract: *This is an approach for designing and implementing a smart glove for deaf and dumb people. There have been several researches done in order to find an easier way for non-vocal people to communicate with vocal people and express themselves to the hearing world. This research aims to develop a sign to English languagetranslator based on smart glove interfaced wirelessly with micro controller and text/voice presenting devices. An approach has been developed and programmed to display English text. In this system is focused with the objective of reducing the communication gap between the normal people and vocally disabled. The whole system has been implemented, programmed, cased and tested with very good results.*
Keywords: *Smart glove, sign language, gesture recognition.*

I. Introduction:

The serious issue for the deaf and dumb community is obviously the difficulty in communicating with vocal people. These people communicate via sign language; however, the main issue is that the majority of people are not familiar with sign language and they are not willing to learn this language. This generated an idea to propose this project in which it will drastically facilitate and improve a communication method between the non-vocal and vocal people.

Many researches have been conducted in the last ten years to develop sign to speech/text translators. Most of these are based on computer vision techniques for sign recognition. The efficiency of these techniques depends on the video quality, which is significantly impacted by the ambient light and situation of the implemented camera (resolution, focusing, alignment and mechanical -vibration). The main advantages of the developed system, with respect to others, are its simplicity, low cost, low power and its full mobility. Also, it is a hand-glove based and thus it can be used even in dark environment, and there is no restriction on the user movement.

All of these systems are computer based, which accordingly increases the cost, size and power, and reduces the mobility of these systems.

II. Methodology:

This sign language to speech or text converter block diagram consist of two sides. One is receiver side and another is transmitter side. In transmitter side it consist of a sensor, power supply unit, microcontroller, UART and transmitter module. The flex sensor attached to the hand glove of the person to record sign. Power supply unit provide supply to microcontroller. power supply block encloses a transformer, bridge rectifier, filter and regulator. Here stepdown transformer is used to step down 230v to 10v AC supply. The bridge rectifier used here is to convert 10v AC to DC power supply for powering microcontroller. Regulator regulates the same output voltage. Now the microcontroller picks the signals from the sensor and built in program, to convert to its corresponding ,English alphabets textually. This converted module is processed by UART. Universal asynchronous receiver and transmitter (UART) is a microchip used for serial communication over a computer or peripheral devices. It is then transmitted to RF module to transfer signal between two device like transmit and to receive. The block diagram for the transmitter side is given in the fig 1.

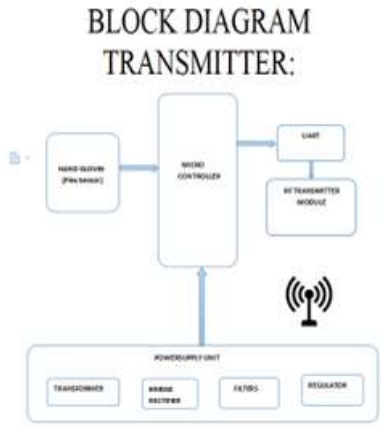

Fig 1: block diagram of transmitter side

The receiver side also have RF receiver to receive signal passed to UART, power supply unit for microcontroller is same as that of the transmitter side. Now the micro controller displays the sign conversion in LCD display or speaker. The block diagram of receiver side is given in the fig 2.

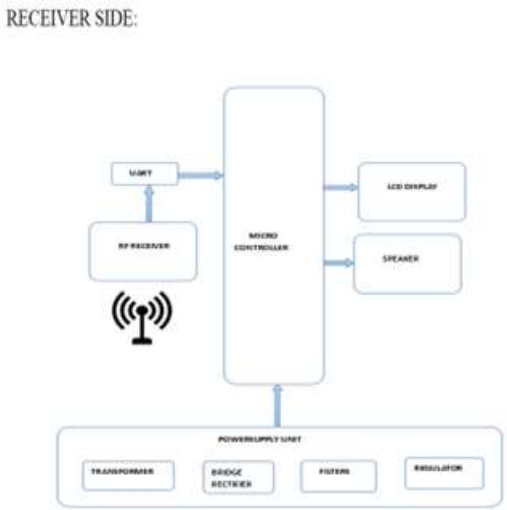

Fig2: Block diagram Of receiver side

System Implementation:

A.Hardware:

In the system design, flex sensors are attached to a hand glove, along each finger length, to work as a gesture recognition. The output of the flex sensors will vary with the bending degree of each finger, and the analog output voltages, which are obtained from these flex sensors, are fed into the microcontroller. The microcontroller processes these analog signals and converts them into digital signals. To make it more flexible for the user, there are three push buttons connected to the PIC microcontroller, one of them is to erase one character, the other one is to clear everything written on LCD and the last one is to read from the LCD. Moreover, the program stored in the microcontroller will also convert the recognized gesture into its equivalent text information. RF trans-receiver has been connected to the PIC to transmit the digital signals wirelessly. In the receiver side, the digital signals obtained will be received wirelessly via RF trans-receiver. Finally, the text information will be displayed on the LCD screen and the text to speech conversion will play out the sound through the speaker.

B. Software :

Software (MPLABIDE) was used to program the system. MPLAB IED is a free, integrated toolset for the development of embedded application. Integrated development environment(IDE) provides a single integrated environment to develop code for embedded microcontrollers. It support project management, code editing, debugging and programming of microchip 8-bit, 16-bit and 32-bit PIC microcontroller and supports automatic code generation with the MPLAB code configurator. The software simulators use the pc tp simulate

the instructions and some peripheral functions of the PICmicro MCU devices. Optional in-circuit emulators and debuggers are also available to test code as it runs in the application hardware. There are two codes, one for the transmitter side and the other one is for the receiver side. The flow charts of the codes are illustrated in Figure 3 and 4. Figure 3 shows the flow chart of the software design in the transmitting side, while the receiver side flow chart of the software is shown in Figure 4. Figure 3 shows how the code in the transmitter side helps in transmitting the sign which user interprets. Once the user shows the gesture, the code in the transmitter side checks whether the values are in range for the particular letter and if it is in range the transmitter transmits, else the code will wait for new values and the process keeps repeating.

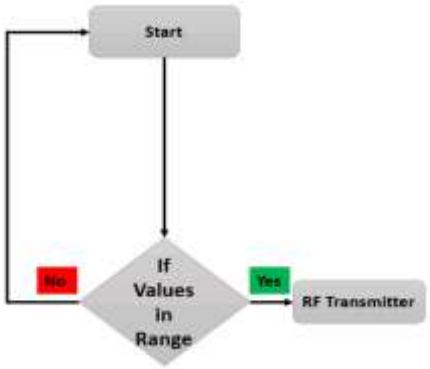

Fig 3: A flow chart for the software transmitter side.

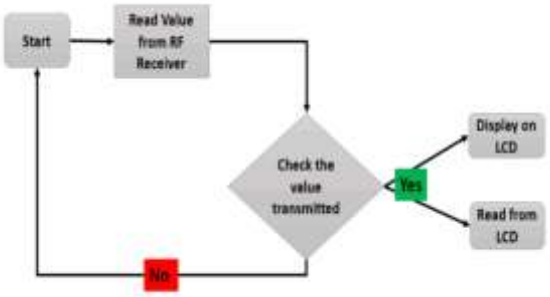

Fig 4: A flow chart for the software receiver side.

Pin Diagram:

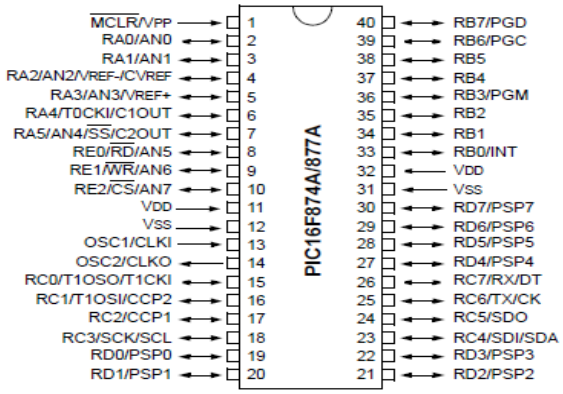

Fig 5: Pin diagram for PIC16F877A

PIC is a family of microcontrollers made by microchip technology. the PIC16F877A has 40 pins and 5 ports. The operating voltage is 2v to 5.5v. The pin diagram of PIC16F877A is given in figure 5. The PIC16F877A features 256 bytes of EEPROM data memory, self programming, an ICP, 2 comparators, 8 channels of 10-bit analog to digital (A/D) converter, 2 capture/ compare/ PWM function. The hardware capabilities of PIC devices range from 6-pin SMD, 8-pin DIP chips up to 144-pin SMD chips. High power and high speed variations. The RAM space is 12 bits, addressed using a 4-bit bank select register and an 8-bit offset

in each instruction.The PIC16F877A has a 13-bit program counter capable of addressing an 8K word x 14 bit program memory space. Accessing a location above the physically implemented address will cause a wraparound.The Reset vector is at 0000h and the interrupt vector is at 0004h.

Lcd Description:

A liquid-crystal display (LCD) is a flat panel display or other electronically modulated optical device that uses the light. Modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCD screens do not use phosphors, they do not suffer image burn-in when a static image is displayed on a screen for a long time. The LCD display is shown in the figure 5.

The LCD back light systems are made highly efficient by applying optical films such as prismatic structure to gain the light into desired viewer direction. The pin diagram of LCD is given in the figure 6.

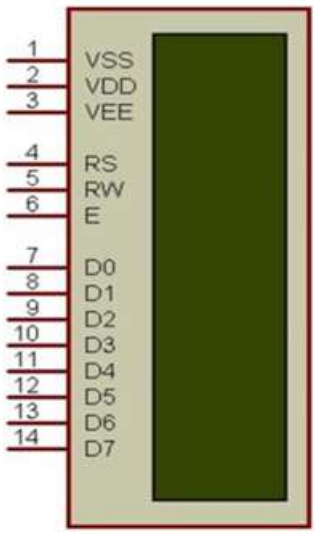

Fig 6. Pin description of LCD

Pin No	Name	Description
Pin No.1	D 7	Data bus line 7(MSB)
Pin No.2	D 6	Data bus line 6
Pin No.3	D 5	Data bus line 5
Pin No.4	D 4	Data bus line 4
Pin No.5	D 3	Data bus line 3
Pin No.6	D 2	Data bus line 2
Pin No.7	D 1	Data bus line 1
Pin No.8	D 0	Data bus line 0(LSB)
Pin No.9	EN 1	Enable signal for row 0 and 1 (1st controller)
Pin No.10	R/W	0= write to LCD module 1= Read from LCD module
Pin No.11	RS	0= Instruction input 1= Data input
Pin No.12	VEE	Contrast adjustment
Pin No.13	VSS	Power supply (GND)
Pin No.14	VCC	Power supply (+5v)
Pin No.15	EN 2	Enable signal for row 2 and 3 (2nd controller)
Pin No.16	NC	Not connected

Stimulation Output:

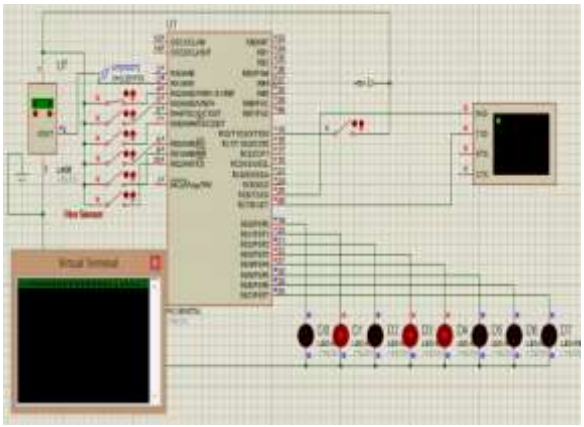

Fig 7: Practical circuit arrangement

The practical circuit arrangement is given in the figure 7. Here the receiver module contains PIC microcontroller, RF receiver and APR9600. The RF receiver connected to PORT B (RB0-RB7) in PIC microcontroller, received signal depends upon the sign to enable the pin of PORT B. APR9600 is connected to PORT D (RD0-RD7) and plays recorded voice depends upon the RF enable pin.

III. Conclusion:

It presents glove-based sign-to-text/voice translating system for deaf and dumb people. The glove represents the Arabic sign language letters as a text on LCD and outputs an audio through the speaker, which helps in limiting the communication barrier between deaf and dumb with vocal people. It has low cost and small in size.It has high resolution and can be operated in dark places.The prototype for the proposed system is given in figure 8.The important of the research is related to its aim to help these class of non-vocal people to communicate with others and improve their contributions to growth and build their nations. The system has been designed, programmed, implemented and tested with a very good results. The system could be extended to cover wider range of sign by using a combination of two gloves instead of one.

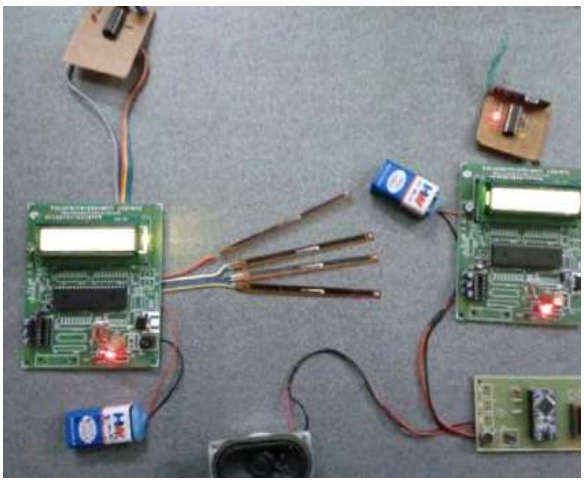

Fig 8: prototype of proposed system

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