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Smart Speaking Gloves for Speechless

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Abstract : *In our day to day life, we observe that the communication of speechless/mute patients with normal peoples find many difficulties. Usually speechless patients communicate in sign languages that is not understood by normal peoples. As we know that visual communication is more effective than verbal communication, so by considering this phenomenon we inspired to have some technological system for communication of speechless patients. We have designed the project that focuses on ease of communication between the speech impaired patients or people with the others. The project consists of the glove that translates the bending movement of the fingers into voice or speech signal using Flex sensors. AVR Microcontroller processes the binary data from flex sensors and further the voice module processes on the microcontroller output to produce speech signal. The message spoken through the speaker is also displayed on the LCD display.*

Keywords – *AVR microcontroller, Bend movement, Speech Impaired, Voice module, Indian Language*

1. INTRODUCTION

The development of the most popular devices for hand movement acquisition, glove-based systems, started about 30 years ago and continues to engage a growing number of researchers. Communication involves the exchange of information, and this can only occur effectively if all participants use a common language.[1] In the recent years, there is a rapid increase in the number of speech - disabled victims due to several reasons like by birth, oral diseases, accidents, etc… and need for the Electronic Assistive Technology (EST) also increases particularly among physically impaired. Speech impairment is a communication problem in which the normal speech is disrupted due to articulation problems, because they are rendered helpless and unable to communicate with the outside world.[2]

This project is useful for the deaf and dumb, it can also be used for the (speechless) patients with half of their bodies paralyzed and who are not able to speak but are able to move their fingers. The aims and objectives of this research work include

• Basic object of this project is to design a portable embedded system
• Developing an economical and simple prototype for the detection of finger gestures
• Cost effective, reliable

Project key features are

• Portable
• Less weight
• Less hardware
• Robust

The prototype consists of Voice module instead of using the Speakjet for the voice translation.
Atmega 32L acts as signal conditioner reducing the size and cost of the circuitary.

1.1 Related work

Many researchers have found out a number of possible solutions. Bhatti et al developed a hand glove with the support of text on LCD display via computer interface with PIC 18F8680 microcontroller having DC power supply instead of battery. Edin et al developed a robotic hand for grasping and lifting different object. Wald developed software for editing automatic speech recognition in real time for deaf and hard-hearing people. Simone et al developed a low-cost method to measure hand and finger range of motion. Zhao et al developed a five-fingered prosthetic hand system. [3]

2. BLOCK DIAGRAM

The schematic block diagram is as shown below

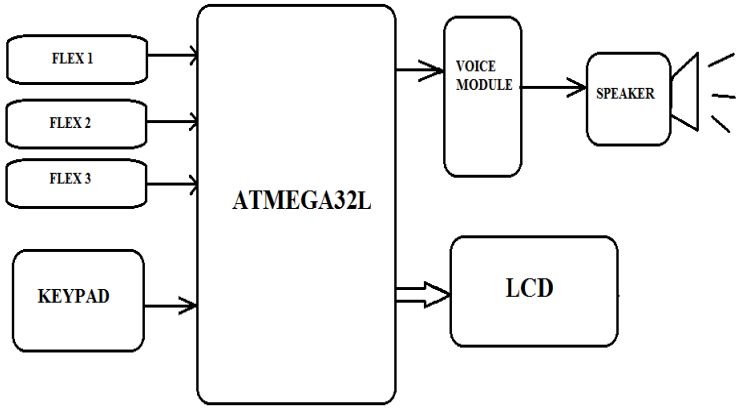

Fig1.System Block Diagram

3. HARDWARE DISCRIPTION

3.1 Flex Sensors

Fig2. Flex sensors

The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. 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.

3.2 AVR Atmega32L Microcontroller

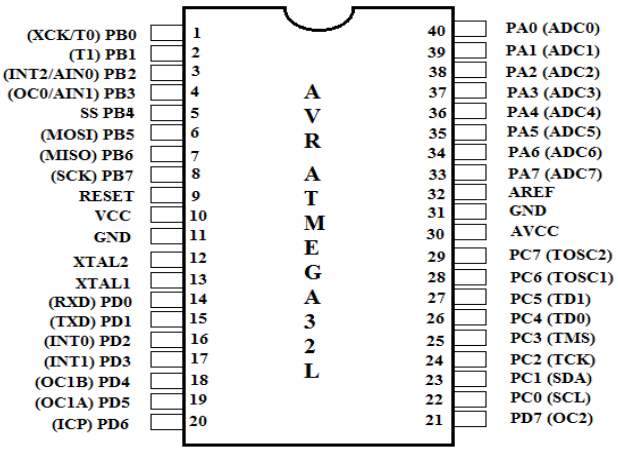

Fig3. Atmega32L Pin diagram

The ATmega32L is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32 achieves throughputs

approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

3.3 Keypad

It acts as an input for Language selection of the voice module output language.

3.4 LCD display

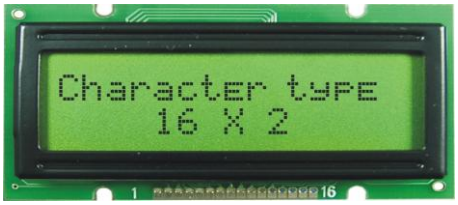

Fig4. LCD display

LCD is a flat panel display, electronic visual display or video display that uses the light modulating properties of liquid crystals

LCD's are used in a wide range of application including computer monitors, televisions, instrument panels, aircraft cockpit displays, and signage.

The LCD screen is more energy efficient and can be disposed of more safely than CRT.

Here we are using 16*2 lcd which is used for displaying output.

3.5 Voice Module

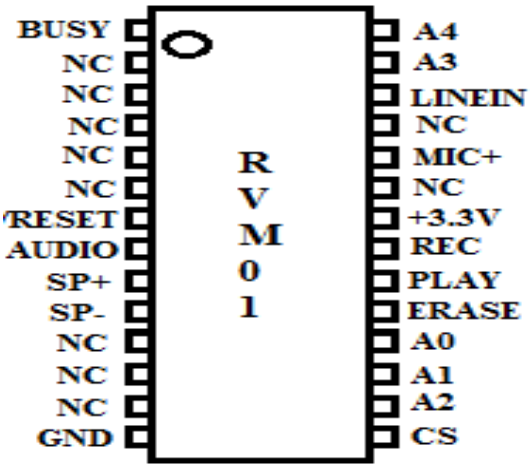

Fig5. Voice Module IC Pin diagram

RVM 01 is a parallel Mode based voice recording & playback chip. It supports 32 Voice groups with total 1600 minutes recording. Sampling is done at 10K sample rate and the voice is recorded in the internal memory of the module. No external MEMORY is required for storing the voice.

3.6 Speaker

Speaker is used to convey the desired electric signal to audio messages. The output from Atmega32L microcontroller is applied to voice module and the conversion will be finally applied to speaker to speak related sentences.

4. HARDWARE AND SOFTWARE USED

The hardware of this research project includes AVR ATMEGA32L; High-performance, Low-power AVR® 8-bit Microcontroller and it has built-in 10 bit ADC, RISC Architecture, In-System Programmable (ISP), Watchdog Timer, High Endurance Non-volatile Memory segments

Hardware also contains mainly the Flex sensors and the Voice module

4.1 Functions of voice module

4.1.1 Voice Recording

Then apply a low signal on the Record PIN. Keep the pin low as long as you have to record. And then pull the pin high again.

After you pull down the record pin a beep will be sounded and only after the beep the recording will start. Normally the recording starts 220ms after the record pin is pulled low.

4.1.2 Voice Playback

A low pulse on Minimum 45 ms should be applied to the Play pin for the message to be played.

4.1.3 Voice Erase

A low signal of minimum 30ms erases the current voice message.

4.2 Software of the project uses Keil IDE Compiler

Keil software is used for the microcontroller programming. It's used to specify the Messages to be operated on and to be passed on to the voice module for conveying the required gesture output through the speakers.

The programming is also done to display the messages on the LCD display simultaneously.

Fig6. Project Workspace

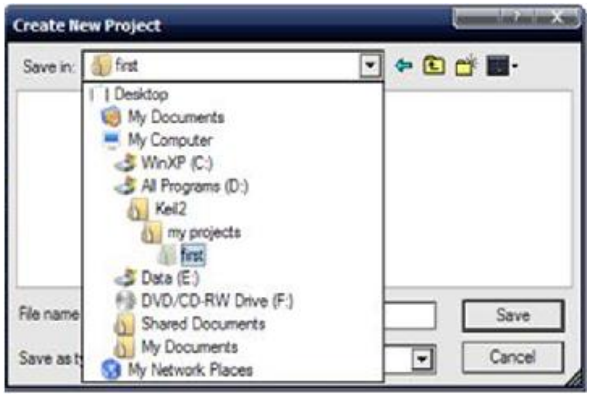

Fig7. Creation of New workspace

5. EXPECTED RESULTS

Table 1 Gesture and Messages

Sr. No.	Binary Code	Hex Code	Gestures	Messages
1	00000	00		No Message
2	01101	0D		I am Hungry
3	01110	0E		Call Doctor

6. CONCLUSION

This prototype is u helpful for the speechless patients. It acts as a tongue to the dumb, a helping hand for the paralytic and special cases of diseases.

As it is portable, requires low power and having less weight and robust gives patient liberty to carry it anywhere at their will.

It can be used for many messages by building the dictionary for complicated systems.

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