

Flex Sensor Based Sign Language for Disabled

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Abstract- Technology has always been of great help to the disabled and given them a helping hand to allow them to live a normal and healthy life like others. We have come up with a novel idea of gloves named hand talk that will convert hand movements into text and allow the deaf to express themselves better. The hand talk glove needs to be worn on the hand by the deaf or mute person and depending on the variation of movement of hand the device will convert it intelligently into voice for the other person to comprehend it easily. The device can sense each movement of the hand carefully. The hand movement will be converted in to resistance by using flex sensor. Depending on the resistance value the voice will produced by APRVOICEIC .Currently the device can converted only few words, but depending on the success of this device few more additional words may be added later onto this expressive system. The gestures can be converted to voice by using a APR 9600 voice storage and retrieval chip. Prerecorded voices are stored into APR memory and when corresponding gestures are received, the appropriate voices are reproduced by the APR through the speaker.

Index Terms- Sign Language; Display Panel; Human-Computer Interface (HCI); Flex Sensors; American Sign Language (ASL); Hand Gesture.

I. 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. Sign language is the language used for deaf and dumb people. It is a communication skill that gestures uses, instead of sound to convey the meaning simultaneously combining hand shapes, orientations and movement of the hands, arms or body and facial expressions to express fluidly a

speaker's thoughts. Signs are used to communicate words and sentences to audience.

A gesture in a sign language is a particular movement of the hands with a specific shape made out of them. A sign language usually provides sign for whole words. It can also provide sign for letters to perform words that don't have corresponding sign in that sign language. In this device Flex Sensor plays the major role, Flex sensors are sensors that change resistance depending on the amount of bend on the sensor. This digital glove aims to lower this barrier in communication. It is electronic device that can translate Sign language into speech in order to make the communication take place between the mute communities with the general public possible. It can also provide sign for letters to perform words that don't have corresponding Sign in that sign language. Sensor gloves technology has been used in a variety of application areas, which demands accurate tracking and interpretation of sign language. In real word, there are many people who are deaf and dumb cannot communicate easily. For communication of deaf and dumb people, we are making electronic hand glove for that people. It is portable and easy to handle. There are two flexing sensor used and each is fitted with length of each finger and thumb. Indian Sign Language's alphabets made using different position of fingers and thumb.

Here, only one hand is used. Their output shown in the LCD. Using this alphabet, we are making word forming and their output shown in the LCD. The sensor output is in analog form so to convert in digital form ADC is used. Then ADC's output goes in microcontroller module where programming is done. And then the output has shown on the LCD).

II. SYSTEM BLOCK DIAGRAM

2.1 Existing Method

2.1.1 Metal Contact Sensor

- In the existing method metal contact sensor is used.
- It does not transfer the data perfectly
- Data loss is occurring.

2.2 Proposed Method

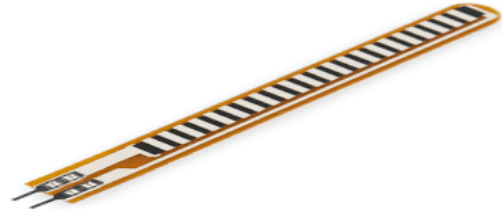
2.2.1 Flex Sensor

- The proposed cost effective embedded system design is based on hand gesture feature and speech interactivity module.
- Here instead of using metal contact sensor, flex sensor is used.
- It is used to convert the hand command into variable resistance.
- Hence dumb person can talk with normal people by using this project.

as variable analog voltage dividers. Inside the flex sensor are carbon resistive elements within a thin flexible substrate. More carbon means less resistance. When the substrate is Bend the sensor produces a resistance output relative to the bend radius. They are usually in the form of a thin strip from 1"-5" long.

There are two types

- Bidirectional
- Unidirectional



2.3 Block Diagram

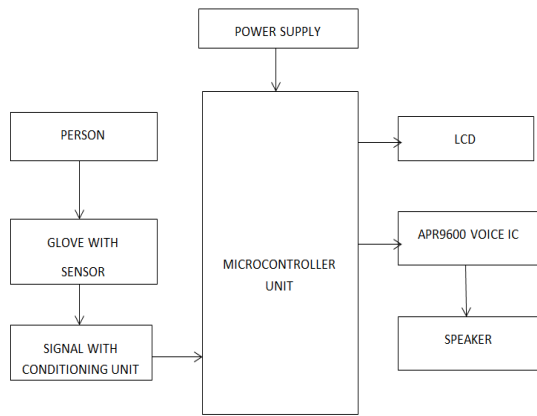


Figure 1: Block Diagram

In this block diagram consists of following,

- Hand glove with flex sensors,
- Signal conditioning unit (resistances to voltage divider circuit),
- Microcontroller,
- Power supply
- Speaker
- Voice IC (APR9600)

III. FLEX SENSOR

Flex sensors are analog resistance that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to resistance the more the bend more resistance value. They works

Figure 2: Flex Sensor

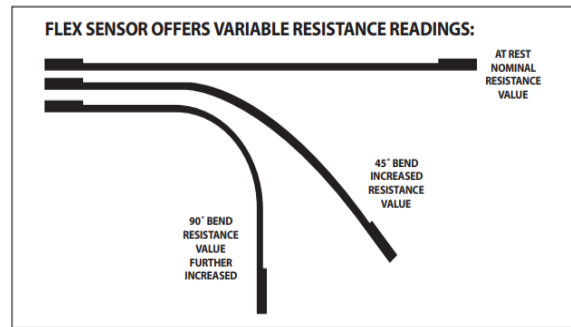


Figure 3: Flex Sensor Variable Resistance Reading

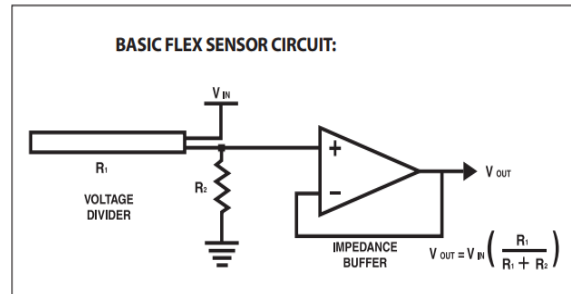


Figure 4: Flex Sensor Circuit

IV. POWER SUPPLY

Power supply unit is a hardware component that supplies power to an electrical device. It gives +5v and +12v supply to the microcontroller and other parts of our project. It receives power from an electrical outlet and converts the current from AC (Alternating current) to DC (Direct current).

The power supply is an integral part of the project and must function correctly for the rest of the components to work.

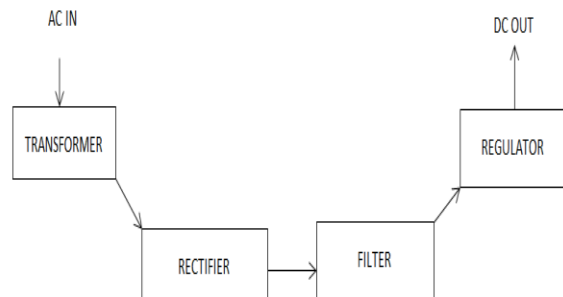


Figure 5: Power Supply Block Diagram

V. PIC MICROCONTROLLER

The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate bus for instruction and data allowing simultaneous access of program and data memory.

The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that it has immunity to noise than other fabrication techniques.

5.1 PIC (16F877A)

Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off. Easy Programming and Erasing are other features of PIC 16F877A.

5.2 Special features of PIC Microcontroller Core Features

- High-performance RISC CPU
- Only 35 single word instructions to learn
- All single cycle instructions except for program branches which are two cycle
- Operating speed: DC - 20 MHz clock input
- DC - 200 ns instruction cycle
- Up to 8K x 14 words of Flash Program Memory,
- Up to 368 x 8 bytes of Data Memory (RAM)

- Up to 256 x 8 bytes of EEPROM data memory
- Pin out compatible to the PIC 16C73/74/76/77
- Interrupt capability (up to 14 internal/external
- Eight level deep hardware stack
- Direct, indirect, and relative addressing modes
- Power-on Reset (POR)
- Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Watchdog Timer (WDT) with its own on-chip RC Oscillator for reliable operation
- Programmable code-protection
- Power saving SLEEP mode

VI. APR VOICE IC (9600)

APR9600 is a low-cost high performance sound record/replay IC incorporating flash analogue storage technique. Recorded sound is retained even after power supply is removed from the module. The replayed sound exhibits high quality with a low noise level. Sampling rate for a 60 second recording period is 4.2 kHz that gives a sound record/replay bandwidth of 20Hz to 2.1 kHz. However, by changing an oscillation resistor, a sampling rate as high as 8.0 kHz can be achieved. This shortens the total length of sound recording to 32 seconds.

Total sound recording time can be varied from 32 seconds to 60 seconds by changing the value of a single resistor. The IC can operate in one of two modes: serial mode and parallel mode.

In serial access mode, sound can be recorded in 256 sections. In parallel access mode, sound can be recorded in 2, 4 or 8 sections. The IC can be controlled simply using push button keys. It is also possible to control the IC using external digital circuitry such as micro-controllers and computers.

The APR9600 has a 28 pin DIP package. Supply voltage is between 4.5V to 6.5V. During recording and replaying, current consumption is 25 mA. In idle mode, the current drops to 10 A.

The APR9600 experimental board is an assembled PCB board consisting of an APR9600 IC, an electrets microphone, support components and necessary switches to allow users to explore all functions of the APR9600 chip. The oscillation resistor is chosen so that the total recording period is 60 seconds with a sampling rate of 4.2 kHz. The board measures 80mm by 55mm.



Figure 6: APR9600 Voice IC

6.1 APR 9600 Circuit Diagram

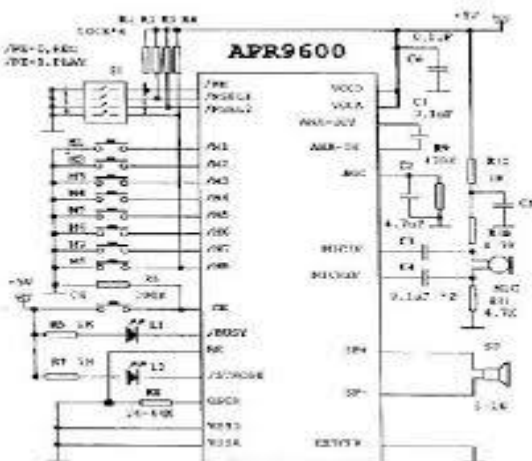


Figure 7: Typical Connections of the APR9600

VII. FABRICATED WORK

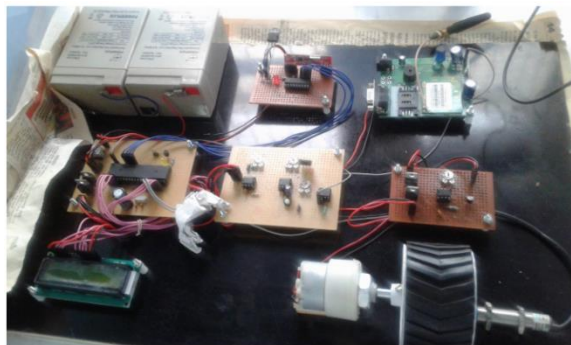


Figure 8: Flex Sensor Based sign Language for Disabled Person

VII.CONCLUSION

As a sign language is a method to convey the thoughts of Deaf and Dumb people, this system

provides the medium which is more reliable and helpful. Here sign gesture gets converted into text and speech so that communication is not limited between them only, utilizing data gloves communication barrier between two different communities is eliminated. Here, the system converts the sign gesture into text as well as speech, using the Gloves. It also facilitates to add more Gestures into the database. And as , the microcontroller is used which is portable and light weighted which makes deaf and dumb people to carry this glove easily.

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