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Hand Gesture Recognition for Deaf and Dumb People Using GSM Module

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Abstract: ***The human being is blessed with ability to express his feelings and emotions through the words as well as sound. It's a god gift of us. But we have some less fortunes human living with us who are deprived of this valuable gift, such people are generally called as deaf and dumb people. So it has a serious problem as compared to blind people. For those people we proposed a new technique called artificial speaking mouth for deaf-dumb people. It will be very helpful to them for conveying their thoughts to others. This system is based on the motion sensor. According to deaf-dumb people, for every motion they have a meaning. In this system, first of all sensor sense the signal and given to the microcontroller ARM7-LPC2148 whereas all the data kept in the database. The microcontroller matches the motion of hand and with the database and message will be display on LCD as well as it produce the speech signal that is we will get the output through the speaker. The system is also included text to speech conversion, But in this system we can communicate with a long distance by using magic glove. In this, words are generated by a microcontroller and it will transmitted in the form of voice calls with the help of GSM modem to communicate with a long distance in a phone call.***

Keywords: Flex sensor, Gesture recognition, GSM modem 800L, ARM 7-LPC2148, Voice recorder IC (APR33A3)

1. Introduction

According to the statistics given by the World Health Organization, about 285 million people in the world are blind,300 million are deaf, 1 million are dumb and many more suffering from one or more physical disabilities. The developments in Science and Technology have reached to great heights in making the Human Life easier and comfortable within a short span of time. During the last few decades, we have come across various technologies that have made our life so easier and comfortable that we even do not have to move our body to do a task. But always running in the race to be ahead of everyone we have forgotten that we still have a section of our population called the physically disabled people who are deprived of the advancements of Science and Technology because it has not given them that comfort that is required by them to feel that they too are the part of the society and they too can walk hand in hand with others. Communication being a fundamental aspect of human life is very much difficult for the people who are Deaf. There are a little means of communication between there people like the Braille Language for communication between Blind people and the Sign Language for Dumb and Deaf people. This paper is going to concentrate on the above mentioned fact and tries to develop a new instrument which can help differently abele people (Deaf and Dumb) to communicate easily in the living world with other normal persons.

2. Block Diagram

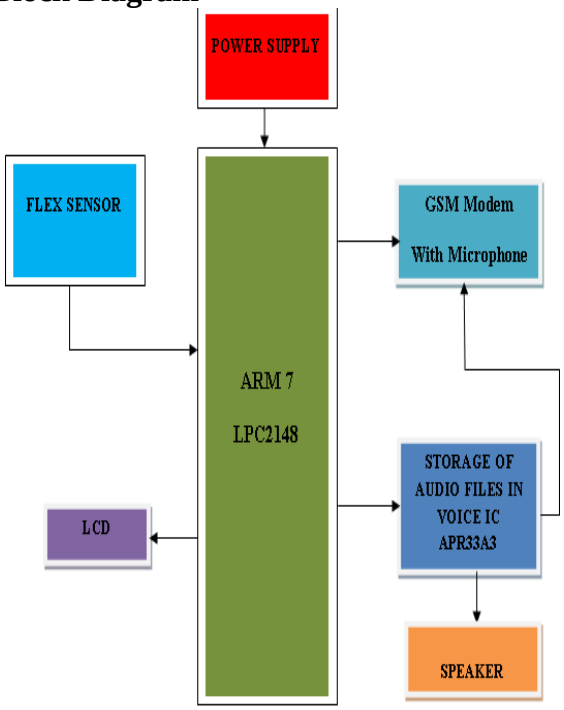


Figure 1: Block Diagram of Proposed System

2.1 Flex Sensor

Flex sensors are analog resistors. They work as variable analog voltage dividers. Inside the flex sensors are carbon resistive elements within a thin flexible substrate. When the substrate is bent the sensor produces a resistance output relative to the bend radius. With a typical flex sensor, a flex of degrees will give to K resistance will a flex of 90 will give 30-40 K ohms. The bend sensor lists resistance of 30-250 ohms.

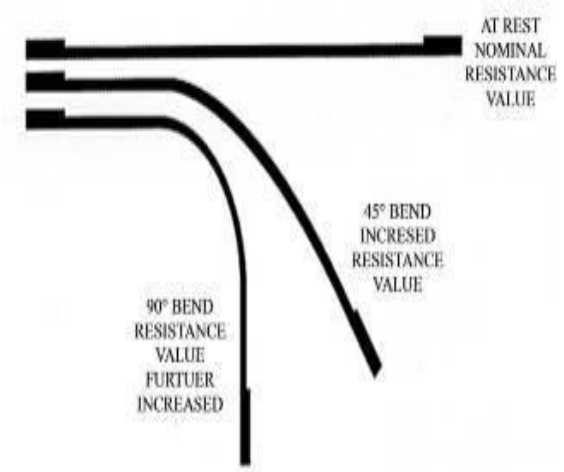


Figure 2.1.1: Variation of resistance with degree in bend

There are two types of flex sensors. One is unidirectional which changes its resistance when it is bent in only one direction. Another one is bidirectional flex sensor which changes its resistance for both directions. In the proposed method bidirectional flex sensor is used.

Signed letters are determined using flex sensor on each finger. The flex sensors change their resistance based on the amount of bend in the sensor as shown in figure 3. As a variable printed resistor, the flex sensor achieves great form-factor on a thin flexible substrate. When sensor placed in gloves is bent, it produces a resistance output correlated to the bend radius—the smaller the radius, the higher the resistance value. They require a 5-volt input and output between 0 and 5V. The sensors are connected to the device via three pin connectors (ground, live, and output). In device, sensors are activated in sleep mode. It enables them to power down mode when not in use.

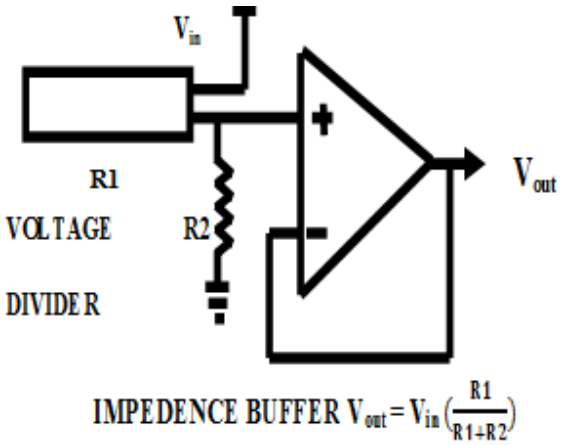


Figure 2.1.2: Basic Flex sensor Circuit

Above figure show circuit of basic flex sensor which consist of two or three sensors are connected. The outputs from the flex sensors are inputted into op-amps and used a non-inverted style setup to amplify their voltage [16].The greater the degree of bending the lower the output voltage. By voltage divider rule, output voltage is determined and given by Vout= Vin *R1 / (R1 + R2), where R1 is the other input resistor to the non-inverting terminal. Characteristics: (a) Resistance V/S Bending (b) Voltage V/S Resistance

Characteristics of flex sensors

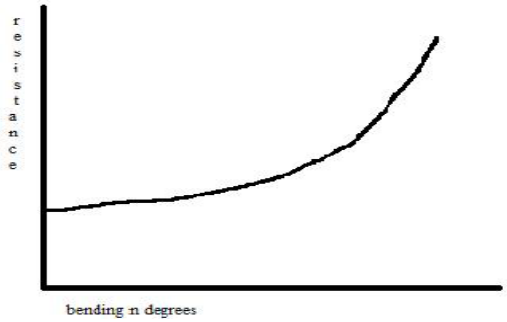


Figure 2.1.3: Bending VS Resistance

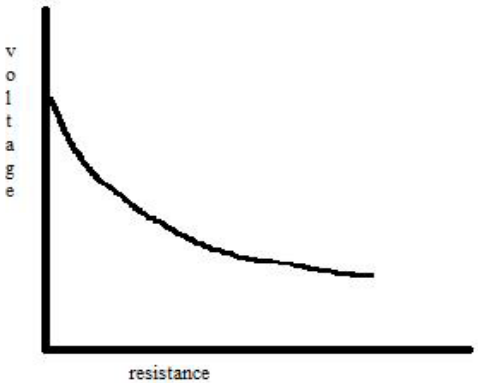


Figure 2.1.4: Resistance VS Voltage

2.2 ARM 7-LPC2148

ARM stands for Acorn RISC machine is a family of instruction set architectures for computer processors based on a reduced instruction set computing (RISC) architecture. And in simple word ARM is "Processor Architecture". Many of newbiees and students have misunderstanding that ARM is microcontroller or processor, but actually ARM is Architecture which is used in many processors and microcontrollers.

LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips (NXP) and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

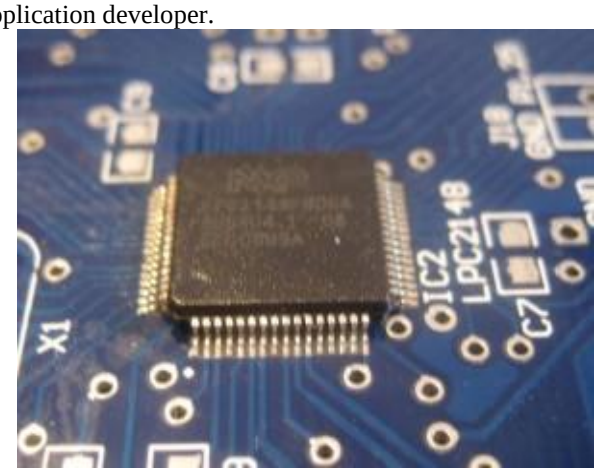


Figure 2.2.1: LPC2148 IC

Features

ARM devices are available in

- 64-pin and tiny LQPF64 package.

- It is 32-bit microcontroller
- ARM7 processor with series LPC2148
- On chip flash memory 512kb
- 16kb on chip RAM
- Two 10-bit ADCs provide a total of 14 analog inputs, with conversion times as low as 2.44micro sec per channel.
- 1 DAC of 10 bit capacity
- Two timers/counters (32-bit each)

2.3 GSM Module (SIM 800L)

Figure 2.3.1: GSM module 800L

The SIM800L module supports quad-band GSM/GPRS network, available for GPRS and SMS message data remote transmission. The SIM800L communicates with microcontroller via UART port, supports command including 3GPP TS 27.007, 27.005 and SIMCOM enhanced AT Commands. It also has built-in level translation, so it can work with microcontroller of higher voltage than 2.8V default. Besides, the board also supports A-GPS technique which is called mobile positioning and gets position by mobile network. This features make it can also be a tracker module.

Specifications

- SIM800 Quad Band GSM Module
- Voltage Supply Required- 9VDC to 12VDC with at least 2A Peak Current Capability
- TTL Rx and TTL Tx and DB9 Connector Based RS232 Outputs
- External Finger type antenna
- Switching Regulator Based Power Supply

Features

- Quad-band 850/900/1800/1900MHz
- Dimensions: 24*24*3mm
- Weight: 3.14g
- Supply voltage range 3.4 ~ 4.4V
- Low power consumption

2.4 Voice Section (APR33A3 IC)

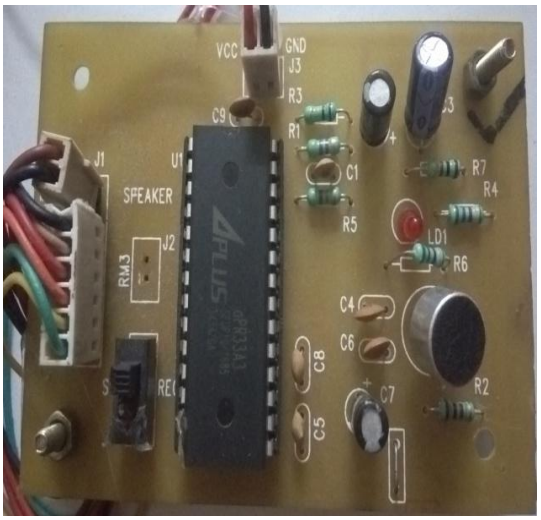


Figure 2.4.1: APR33A3 IC

Today's consumers demand the best in audio/voice. They want crystal-clear sound wherever they are in whatever format they want to use. APLUS delivers the technology to enhance a listener's audio/voice experience. The APR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor. The aPR33A series C2.0 is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch, It is suitable in simple interface or need to limit the length of single message, e.g. toys, leave messages system, answering machine etc. Meanwhile, this mode provides the power-management system. Users can let the chip enter power-down mode when unused. It can effectively reduce electric current consuming to 15uA and increase the using time in any projects powered by batteries.

Features

- Operating Voltage Range: 3V ~ 6.5V
- Single Chip, High Quality Audio/Voice Recording & Playback Solution
- No External ICs Required
- Minimum External Components
- User Friendly, Easy to Use Operation
- Programming & Development Systems Not Required
- 170/ 340/ 680 sec. Voice Recording Length in aPR33A1/aPR33A2/aPR33A3
- Powerful 16-Bits Digital Audio Processor.
- Nonvolatile Flash Memory Technology
- No Battery Backup Required
- External Reset pin.

3. Results & Discussions

In this Prototype version, the user forms a sign and holds it for two seconds to ensure recognition. The system is capable of recognizing signs more quickly than this arbitrary two seconds limit. Hence it is a low time consuming approach. Furthermore real time recognition ratio of nearly 99% can be easily achieved.

A: **Advantages**

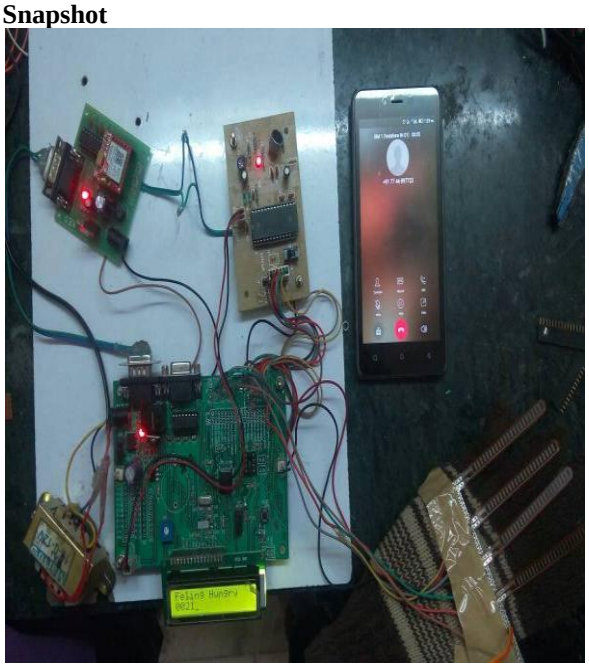
- Low cost
- Compact system
- Flexible to users
- It takes less power to operate system
- Easy interpretation.
- Good means of communication to normal people to Differently abled persons Used for communicating at long distances.

B: Applications

- Physically challenged persons
- Conveying information related operations

C: Digital technique for Bending

D: Snapshot



E: Future Scope

There can be numerous future advancements that can be associated with this research work some of which are described below as:

Sr No	*Digital pattern*	*Message*
1	10000	Please Headache
2	11000	Body Pain
3	00110	Stomach Problem
4	00010	Please help me
5	00001	Feeling hungry
6	01000	Feeling Trusty
7	00100	Feeling Sleepy

1) We are using the ARM7 GSM Shield to make connectivity over long distances. But we are using only the call and text message feature of this technology. In future some new way can be developed that can use the Internet connectivity feature of GSM Shield to make the connectivity of the device better and for longer distances.
2) There can be more perfection in sensing the movements and gestures so that the message transmission can be made smoother.
3) Since this is a type of wearable technology, we can think of new advancements that can be implanted so that the device can be made more compact, faster and reliable.

4. Conclusion

The person can communicate and transfer the message as per his ability and desire. The dumb can use their Sign language to transmit the message while those who are unable to understand the Sign Language can make use of the device to get the output in the audio form for normal or blind people and in the form of Braille Language for Blind and Deaf person. Moreover the message can also be displayed in the form of text on the LCD screen for Deaf people and even the transmission of the message can be made over large distances by the use GSM Wireless Networks. Thus this approach can tackle to any type of difficulty that can come across the process of communication among differently abled people and the normal world.

5. Acknowledgements

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