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Microcontroller Based Data Glove to Aid Speech Impaired

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ABSTRACT: The world is a very diverse place with speech as basic form of communication but language differences restrain people to communicate with each other. The rift is much wider for differently abled people (Dumb). Our project aims for reducing this barrier between a normal person and with Speech Disability. With the development and advancements in technology the need of developing an electronic device that can serve as an intermediate to interpret their sign language into speech, in order for effective communication take place between the mute communities with the general public possible. This project converts the hand gesture into voice and text by the primary use of flex sensors, mounted on Gloves which are wireless data gloves used for taking input driving gloves are integrated with flex sensors for each finger. Bending causes change in the resistance of flex sensor and potential varies accordingly. This input variation is given to microcontroller which using ADC converts analog signals into digital signal. This Digital Signals are then transmitted to an Android phone at other side where further processing of data takes place, needed to recognize hand gesture data which we have stored already in memory.

KEYWORDS: Embedded system, Flex sensors, AVR microcontroller, ASL (American Sign Language), Android application

I.INTRODUCTION

This system gives voice to voiceless i.e. voice is given to the person who is not able to speak. Dumb/ mute people use sign language to communicate with the other people. Sign language uses gestures instead of voice to communicate words and sentence with the audience. People who cannot speak use their hands and face express thoughts or to communicate. Hand shapes and movement and facial expressions are major part of sign language. Unfortunately the normal people who are able to speak cannot understand what mute people are saying. So this will help normal people too to understand and help them. In this system flex sensors plays the major role because they give input to the accelerometer. Flex sensors are attached to the glove. These are the sensors whose resistivity varies with the amount of bend [1-3]. Based on the resistivity the accelerometer gives the output. In this paper, AVR microcontroller is used to take input from flex sensors and then this analogue data is converted to digital form by using micro controller. All the data from microcontroller is sent to android phone and accordingly the android phone will speak the corresponding character which has been sensed.

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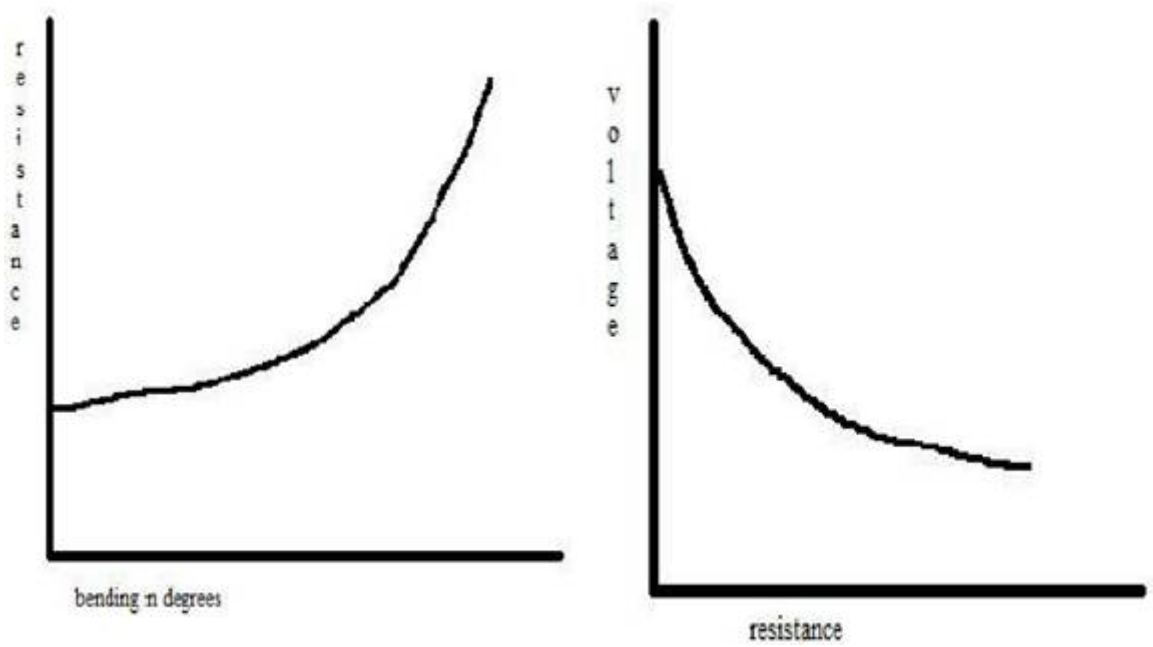
II.IMPORTANT PARAMETERS

A. *Flex Sensors*

Flex sensors are attached to the gloves of the dumb and mute people. Through these gloves gestures has to be performed. Flex sensors changes their resistance as per the degree of bend. When there is no bend, its resistance is 10kΩ. Flex sensors consist of number of conducting particles. When there is a bend, conducting particles in the flex sensors get separated. Due to this, current decreases and resistance increases. Therefore, flex sensors are also known as bend sensors.

The following are the electrical specifications of the flex sensors.

- Flat resistance : 10 kΩ
- Bend Resistance Range : 60 kΩ to 110 kΩ
- Power Ratings : 0.5 watts continuous.1 watts peak
- Height : <= 0.43mm



B. American Sign Language

Gestures are specifically performing action or hand movements to convey meaningful information. ASL is a standard sign language which is used in US and Canada. In this research American Sign Language is used. To learn this language dumb people need to undergo special training. ASL is transmitted from generation to generation primarily through residential schools and dumb adults. The most effective way to communicate with dumb people is to use sign language. The simplest system includes understanding of finger spellings. These are shown below. According to these finger spellings database has been created for each alphabet [1-3].

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C. Proposed system

The proposed model will be consisting of combination of hardware and software. Hardware part consists ofmicrocontroller, flex sensor for each finger, accelerometer with gyroscope, android phone and Bluetooth module. Software part consists of programming for android phone application.

Hardware part will be consisting of flex sensors to take input from different gestures through gloves, microcontroller to convert input analogue data to digital data and for further processing, power supply to provide voltages to specific units, and finally Bluetooth module to send the data from controller to android mobile. Here HC-05 Bluetooth module will be used. The proposed system is shown below:

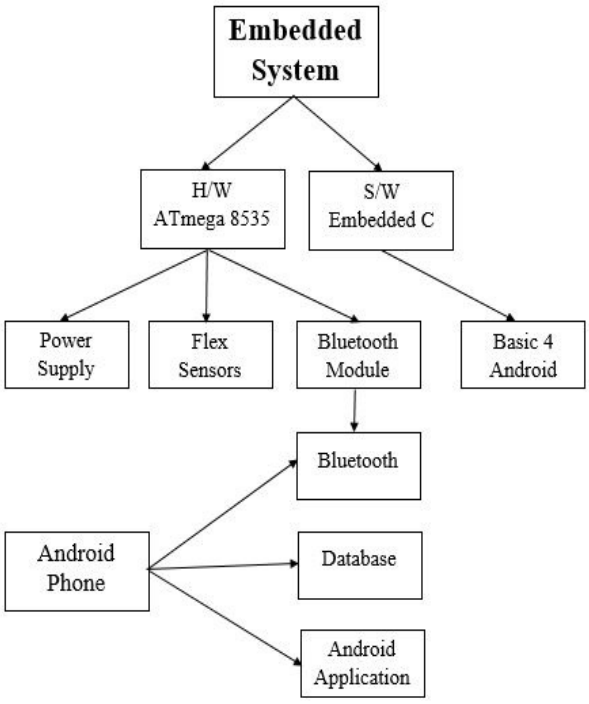
III. THE PROPOSED SYSTEM

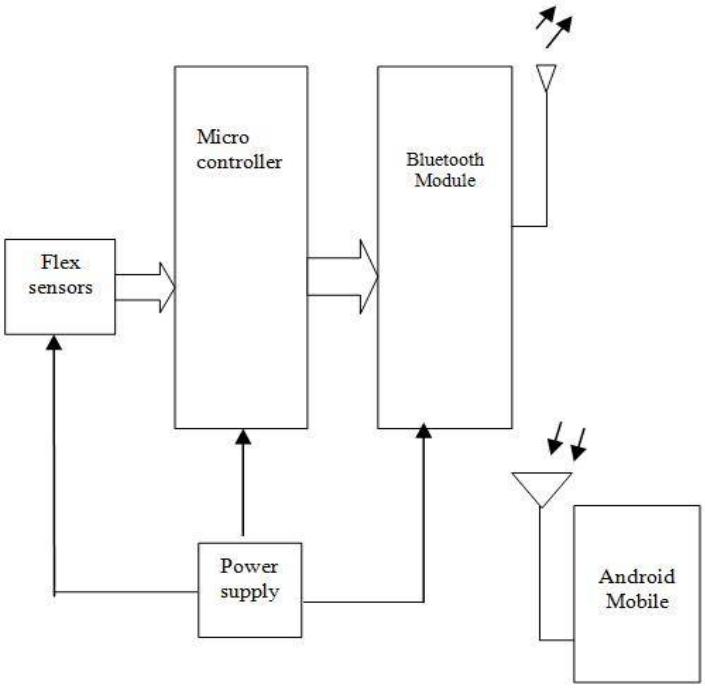
A. System Overview

The proposed system is divided into the following sections

B. Block Diagram

The Block Diagram of the system is given below:





C. Working Principle

The functioning of the various diverse blocks and sections used in the system proposed are given below.

Flex sensors

Flex sensors are attached to data glove. These are used to take physical values for processing. Resistivity of flex sensors changes as per the degree of ‘curve’ or ‘bend’. Flex sensors are attached to port A of the controller as port A pins are ADC pins. So the analog data is converted to digital form, as the mute people perform different gestures we will get different value of resistance for different gestures. And according to that database is created. This analog data from flex sensors is given to microcontroller for further processing.

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Power Supply

Power supply consists of bridge rectifier, filter and regulator IC. The regulator used here is a LM7805 which converts 9V DC into desired 5V DC voltage.AnATmega microcontroller and flex sensor need 5V DC voltage whereas Bluetooth module requirement is 3.3V.

Microcontroller

This is the core of the complete system. Here AVR ATmega 8535 microcontroller is used. As it has in built ADC on portA. The analog input data from data glove is converted to digital form by ADC of controller. The digital data is then serially sent to android phone using Bluetooth module. Embedded C servers as a programming tool.

Bluetooth Module

The microcontroller sends the digital data to android phone by using Bluetooth module. In the proposed system, HC-05 Bluetooth module is used. It makes good serial communication with AVR microcontroller.

Android Mobile

The digital data from controller is passed to android device using Bluetooth. The data is compared withthe database which was created for different alphabets of American Sign Language present in the phone. When we find a match with the data in the database then our required outputi.e. text and corresponding pronunciation is obtained.

D. Technology & Programming Languages

We use Embedded Systems Technology here as it is the future of present day modern electronics. The work is and integration of hardware and software. The followings are the tools, Programming Languages & technologies used in the system

For Embedded System

- Embedded Technology
- AVR Based Controller
- Embedded C programming
- Proteus Software for PCB Designing
- Dip Trace for PCB layout

For Android mobile

- SQL server based database
- Basic4Android software
- Android application

E. Steps for project development

The following are the steps for creating such a system:

- Defining the Problem
- Understanding the Need & Usability in real life
- Developing Block Diagram
- Designing Circuits of individual blocks
- Testing circuits in LAB & Finalizing
- Developing PCB on PC and getting it printed
- Soldering the components
- Testing and troubleshooting
- Developing Flowchart for the entire process
- Writing, Compilation & Burning actual

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Software Program, as well as testing and debugging

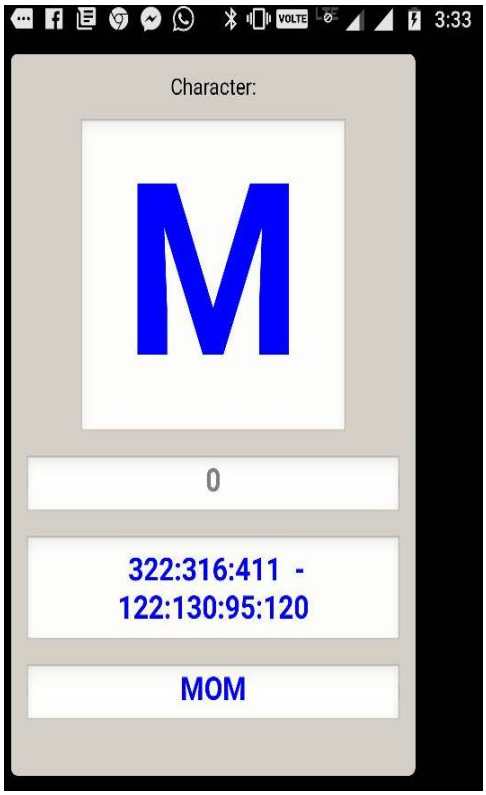
- Developing Flowchart for Android Side Software and developing Data Flow Diagram
- Writing actual code and finally Running the system [4]

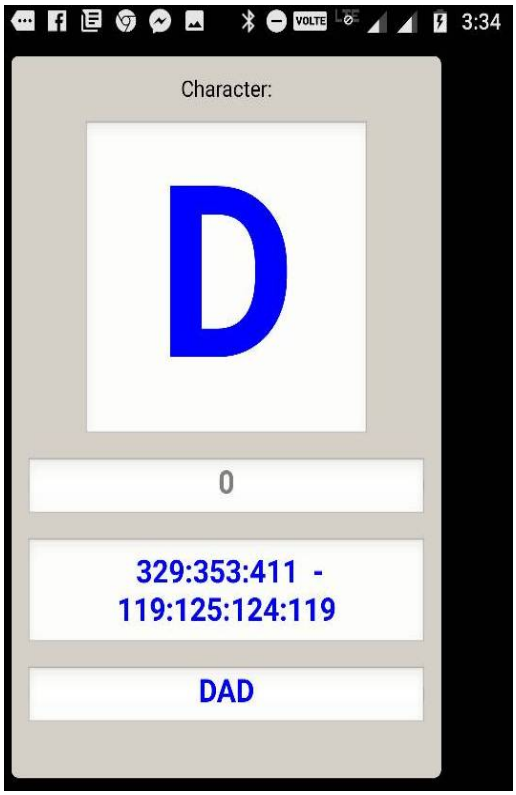
IV. APPLICATIONS & ADVANTAGES

- The normal person doesn't need to learn sign language as he will get to know by audio and text what the dumb person is trying to say.
- It is a compact device and can be easily carried out anywhere.
- Nowadays most of the people use android mobile so it's a good system because of availability of various features and open source nature of android.
- It is a low cost device.
- It takes less power to operate system.

V.RESULT

The prototype system which is developed is able to identify characters and combine them to form words, although incorporation of ASL into the system provides a challenge as multiple alphabets have a similar gesture.





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VI.CONCLUSION

The project aims to facilitate the communication between mute community and normal. This system will simplify dumb person's everyday life. It can even serviceable for the communication between blind and the dumb community. System overall is potent and structured because of the use of android phone andAVR microcontroller.

VII. FUTURE WORK

- The system can be extended to support more number of signs, and different languages mode.
- Different software development strategies and various programming techniques can be exploited to enhance system's efficiency.

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