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AUTOMATED HAND-GESTURE SPEECH RECOGNITION SYSTEM IN ENGLISH

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ABSTRACT

A Dumb Person throughout the world uses sign language to communicate and are specially trained to use this sign language but we normal people are incapable of understanding what the dumb person is trying to say. The advancement in embedded system can provide a space to design and develop a translator system to concert the sign language into speech. Nowadays embedded system has become an important trend in all applications.

Keywords: Embedded System, Flex Sensor, Microcontroller, ASL(American Sign Language).

I. INTRODUCTION

As our idea behind developing this project suggests, this system gives voice to voiceless (Automated hand gesture speech recognition system) i.e., voice is given to the person who are not able to speak. Dumb/mute people use sign language to communicate. Sign language uses gestures instead of sound to convey information. This language includes combination of hand shapes, hand movements and facial expressions to express individual's thoughts. This sign language plays a vital role for deaf and mute people to communicate among themselves or with normal people in a non-verbal manner. It is the primary method to convey the messages, which are usually conducted in a three-dimensional space, known as a signing space[4]. In our proposed system flex sensors plays the major role. They are attached to the glove using needle and thread. Flex sensors are the sensors whose resistivity varies with the amount they are bend. 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 mobile application will speak and present the corresponding character which has been sensed.

II. PROBLEM DEFINITION

As we all know dumb people uses the sign language to communicate each other but while communicating with normal person this sign language becomes main barrier because the normal person does not know the sign language which leads to communication gap between normal people and dumb community. From this project we are giving a try to reduce this communication gap which will help both the normal and dumb community.

III. EXIXTING SYSTEM

Hand gesture recognition is mainly divided into two parts which are static gesture recognition and dynamic gesture recognition, static gesture recognition is the recognition of hand shape, read out the meaning of hand expression, while dynamic hand gesture recognition is the recognition of hand motion trajectory in space, and then perform the corresponding operation based on obtained trajectory parameters, such as for the playing courseware on the projection.

The traditional gesture recognition was through the use of wearable technology, allowing users to do some hand gestures with special data gloves on, the data gloves would transfer user's generated gestures and location information to the computer and help it comprehend the gestures and behavior of uses. Given picture shows a multi-function virtual reality device composed of many sensors on the glove called Immersion Cyber Grasp. Through the software mapping, the virtual objects can be shifted, clutched and rotated by the glove with the ability of "reach into the computer".

The glove is capable of transmitting theses hand gestures to the computer in real time accurately, and then receives feedback from the virtual environment to the operator. It provides users with a direct and universal human-computer interaction mode with the advantages of high accuracy, simple data and fast processing

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speed, etc., but because of the shortcomings of expensive equipment, inconvenient operation, and not suitable for long-distance control, this kind of interaction model is hard to get promotion.

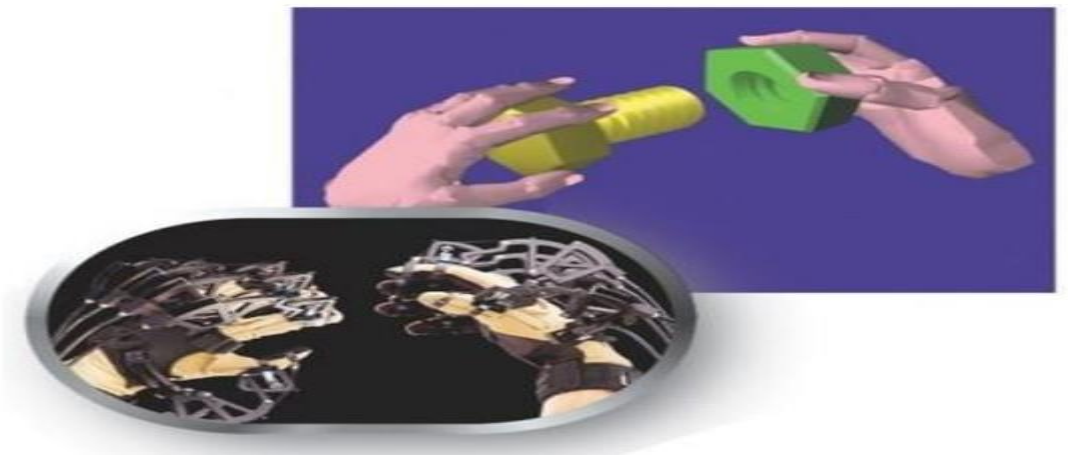

Figure 1: Immersion Cyber-Grasp data glove

Most of the previous work on real-time hand gesture recognition have focused on extracting features by considering sEMG recordings from electrodes which are placed on the forearm as an individual and uncorrelated entities. To the best of our knowledge, only Furui et al. have explored the correlations between the sEMG channels. However, Furui et al. performed gesture prediction for all bins, even when a gesture onset was not present [2]

Sensor Based Techniques (SBT) for gesture recognition have been found best alternative as compared to Vision Based Techniques (VBT). SBT uses either a template matching method or model based methods. The most important advantage of using SBT is its portability, small size instrument compared to cameras or other image capturing devices. In sensor based methods, there is a use of Inertial Measurement Unit (IMU) sensors and Flex Sensors for hand pattern recognition. The work which is presented in [5] uses ten flex sensors and one IMU sensor measuring accelerometer readings. However, using many flex sensors is problematic as the permanent bending of any flex sensor results in different output compared to unbended flex sensor. So utmost care is required while performing gesture using many flex sensors. Again in [5], the data captured through accelerometer sensor is not preprocessed to remove noise present in those readings for template matching algorithm i.e. Distance Time Warping (DTW). Even in DTW is used to classify eight patterns. But amplitude variation in different samples of the same gesture can affect the recognition and might result in false classification. Additionally, the increasing number of new gestures in template matching adds to computational complexity. As a result real time response is not obtained during runtime pattern matching.

Gestures are nonverbally interchanged messages and may be understood by seeing. This nonverbal communication is what called signing. During this project a model is produced to recognize fingers spelling based hand gestures so as to make an entire word by combining each gesture. Normal people and deaf and dumb people depend on vision based communication for interaction. The aim is to develop a user-friendly human computer interface where the PC understands the human signing[3].

IV. PROPOSED SYSTEM

Our proposed model will be consisting of combination of both hardware and software. Hardware part includes flex sensors on each finger, microcontroller, power supply, and android phone and Bluetooth module where Software part includes programming for android phone application. Hardware part which 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.

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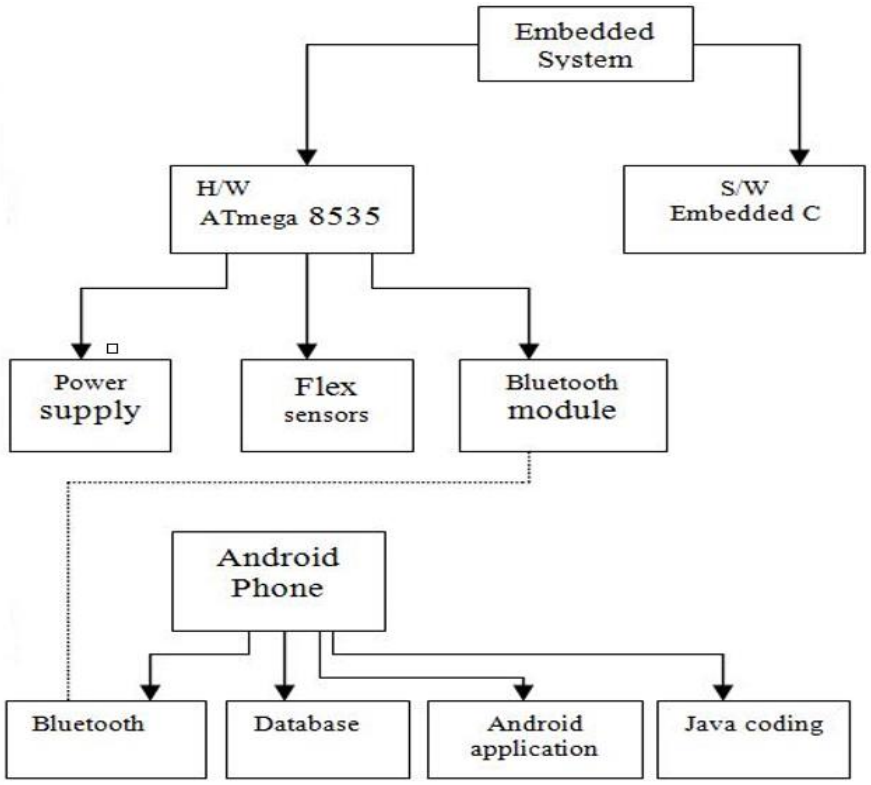

Figure 2: Architectural Design.

V. MODULES

HARDWARE MODULE

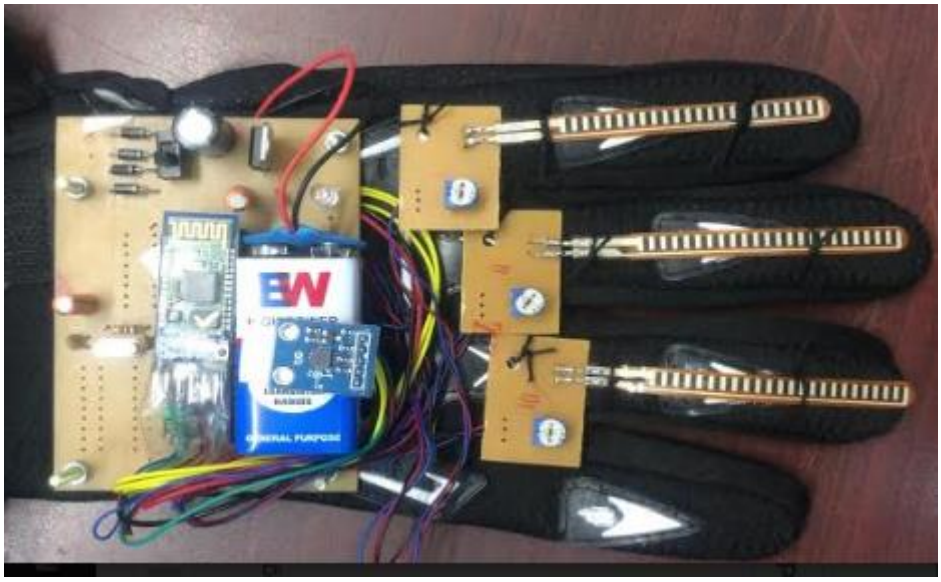

Figure 3: Gesture Generator.

This project is mainly divided in to hardware module and software module. Hardware has one microcontroller named ATMEGA16 which has 40 pins and four ports A,B,C and D. At port A of the controller all the sensors are connected. The main roles are performed by the sensors i.e., flex sensor and the accelerometer.

As the flex sensors bends the resistance get change but we required the voltage to convert this voltage we used another variable resistor for each flex sensor between the junction of both the resistor the resistance is get changed in to voltage. Each of voltage generated by flex sensor will go to ADC(analog to digital converter). Another sensor we used is accelerometer for this also we gave power supply ground and output which will stored in ADC.

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Figure 4: Bluetooth Module HC05

The data received by analog to digital converter get converted and sent to the Bluetooth module for serial communication with our android mobile

SOFTWARE MODULE

It has mobile application through which the device is going to show output/result for the communication this application needs the Bluetooth connection with our hardware device. Once the connection of hardware and application made the data which received by the Bluetooth module will be sent to the application for displaying the results.

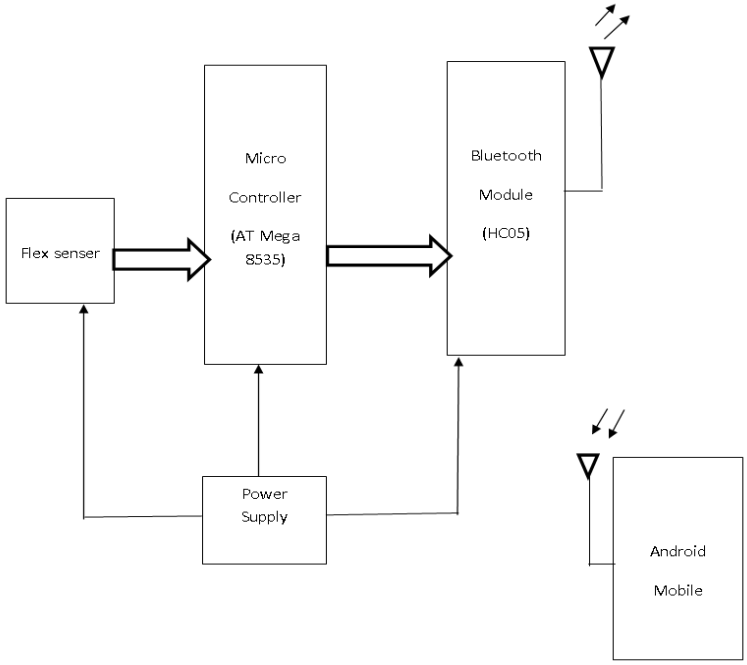

Figure 5: Functional Diagram

VI. FUTURE SCOPE

- The system can be extended to support a greater number of signs, and different languages mode.
- In future, the system can be extended for designing of a jacket which will be capable of determining movement of animals.
- Different software development strategies and various programming techniques can be exploited to enhance system's efficiency.

VII. APPPLICATION

- 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 be carried anywhere.
- Nowadays most of the people use android mobile so it's a good system because of availability of various features and its open-source nature.

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VIII. CONCLUSION

The project aims to reduce the communication gap between deaf or mute community with normal people. This system will improve dumb/ deaf person's lifestyle or it will make their life easier. Using this device in day-to-day life of mute peoples a kind of voice will be given to them. Even it will be beneficial for the communication between the blind person and the dumb person.

IX. REFERENCES

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