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Survey on Sign language to Speech Conversion

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ABSTRACT: Human being interact each other to convey their ideas, thoughts, and experience to the people around them. But, there is some deaf mute people in the world. In this paper, the idea is proposed smart glove which can be convert sign language to speech output. The glove will help in producing artificial speech which produces daily communication for speech impaired person. Compared to other gestures like body, face, and head; hand gesture plays an important role, because it express as soon as reaction of users view. This paper shows flex sensor based gesture recognition module is develop to recognize English alphabet and few words and text to speech synthesizer. This is basically, data glove and microcontroller based system. Flex sensor based data glove can detect all the movement of the hand and microcontroller based system converts some specified movement into human recognizable voice. This paper provides map for developing such glove.

KEYWORDS: Flex sensors, Gloves, ATmega 328 Microcontroller, Bluetooth module, Speaker, Memory module, LCD Display.

I. INTRODUCTION

The development of the most popular devices for hand movement acquisition, glove based systems started about 30 years ago continues to engage a growing numbers of researches. Communication means exchange of information, it becomes effective if all using same media or language for conveying information. Generally, mute people uses sign language for communication in which gestures are used to convey meaning instead of sound. Signs are used to communicate words and sentences to audience. In this system, flex sensor plays an important role. Flex sensor are sensor in which resistance changing according to degree of bending. The Hand Talk Glove is a normal, cloth driving glove fitted with flex sensor along the length of each finger and the thumb. The microcontroller and sensor based data glove help to lower communication gap between deaf dumb and normal person. This paper contains the map to develop a gesture vocalizer.

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessor and Microcontroller. Microprocessors are commonly referred to as general purpose processor as they simply accept the inputs, process it and gives the output. In contrast, a microcontroller not and dump only accepts the data as inputs but also manipulate it, interfaces the data with various devices, control the data and finally gives the result. The "Speaking Microcontroller for deaf peoples" using ATMEGA 328 microcontroller is an exclusive project which is used to help the deaf and dumb people to announce their requirement using SD card module.

One of the many areas in which embedded system show great promise is assistive technologies, which address the special need of those with impairment. This system present Hand Talk, a "Smart Glove", worn by a person, which recognize basic hand gestures and convert them into electrical signal using motion sensors and after processing of the signal display on the computer monitor in the form of text. In this system the Flex sensor is used as a motion sensor. This system uses the Arduino Duemilanove Board as a microcontroller which is an advance version of the microcontroller which makes this system very compact and easily portable.

In general, deaf people have difficulty in communicating with others who don't understand sign language. Even those who do speak aloud typically have a "deaf voice" of which they are self-conscious and that can make them reticent. The Hand Talk glove is a normal, cloth driving glove fitted with flex sensors along the length of each finger and the thumb. The sensors output a stream of data that varies with degree of bend. The output from the sensor is

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analog values it is converted to digital and processed by using microcontroller and then it will be transmitted through wireless communication (RF), then it will be received in the Receiver section and processed using responds in the voice using speaker. In this project Flex Sensor Plays the major role, Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor. They convert the change in bend to electrical resistance - the more the bend, the more the resistance value. They are usually in the form of a thin strip from 1"-5" long that vary in resistance from approximately 10 to 50 kilo ohms. They are often used in gloves to sense finger movement. Flex sensors are analog resistors. They work 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 bent the sensor produces a resistance output relative to the bend radius. With a typical flex sensor, a flex of 0 degrees will give 10K resistance with a flex of 90degrees will give 30-40 K ohms. The Bend Sensor lists resistance of 30-250 K ohms. In this system we use Radio Frequency Signal to transmit the signal from transmitters to Receptors, in this project we have used microcontroller, a speech IC and also a speaker to produce the output.

This paper accentuates the improvement done over the years to increase efficiency and accuracy. In a narrow spectrum it acts as a language interpreter and provides a convenient way for communication and provides a simplified way for communication between deaf and dumb community and normal people. In figure 1, we have shown the sample for general Sign Language.

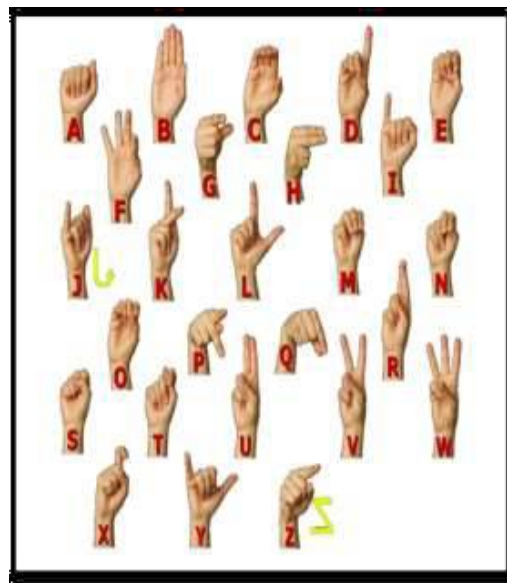


Fig 1 Sample Sign Language

The main of the this work is to design and implement a system to translate finger spelling to speech using recognize technique. The other applications of hand gesture recognition system include character recognition , gesture recognition , robotic arm controller. It gives related work , explain the system architecture and information about the component. It provides discussion of applications and conclusions.

II. RELATED WORK

Sign language recognition system mainly have two well known approaches these are Image Processing technique and another is Microcontroller and Sensor based data glove. These approach are also known as vision based and sensor based technique.



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P. Subha Rajaram had proposed a system that recognize sign language gestures using image processing. In a vision based gesture recognition system , a camera is used for capturing the image or video of a gesture. The capture image is sent to the image processing unit where it is processed through image processing technique. After that it goes to feature extraction for image preprocessed. Then extracted is for gesture recognition hand tracking system. The system generate a binary code of gesture corresponding to the finger positions. In this work author has exploed Hidden Markov Model (HMM) and Artificial Neural Networks (ANN) use to extract the image and eliminate background noise.

Issues To Hand Gesture Recognition: Extraction Methods And Features Extraction :

The input hand image is segmented using two different methods ; skin color based segmentation by applying HSV color model and clustering based thresholding techniques. Some operations are performed to capture the shape of the hand to extract hand feature; the modified Direction Analysis Algorithm are adopted to find a relationship between statistical parameters (variance and covariance) from the data, and used to compute object (hand) slope and trend by finding the direction of the hand gesture. Gesture recognition system into mainly three steps after acquiring the input image from camera(s), videos or even data glove instrumented device. These steps are: Extraction Method, features estimation and extraction, and classification or recognition

1. Extraction Method and image pre-processing:

Segmentation process is the first process for recognizing hand gestures. It is the process of dividing the input image (in this case hand gesture image) into regions separated by boundaries. The segmentation process depends on the type of gesture, if it is dynamic gesture then the hand gesture need to be located and tracked , if it is static gesture (posture) the input image have to be segmented only. The hand should be located firstly, generally a bounding box is used to specify the depending on the skin color and secondly, the hand have to be tracked, for tracking the hand there are two main approaches; either the video is divided into frames and each frame have to be processed alone, in this case the hand frame is treated as a posture and segmented , or using some tracking information such as shape, skin color using some tools such as Kalman filter.

2. Features Extraction:

Good segmentation process leads to perfect features extraction process and the latter play an important role in a successful recognition process. Features vector of the segmented image can be extracted in different ways according to particular application. Various methods have been International Journal of Artificial Intelligence & Applications (IJAI), July 2012 applied for representing the features can be extracted. Some methods used the shape of the hand such as hand contour and silhouette while others utilized fingertips position, palm center, etc created 13 parameters as a feature vector, the first parameters represents the ratio aspect of the bounding box of the hand and the rest 12 parameters are mean values of brightness pixels in the image.

3. Gestures Classification:

After modeling and analysis of the input hand image, gesture classification method is used to recognize the gesture. Recognition process affected with the proper selection of feature parameters and suitable classification algorithm . For example edge detection or contour operators cannot be used for gesture recognition since many hand postures are generated and could produce misclassification.

Following figure shows architecture of vision based recognize system .

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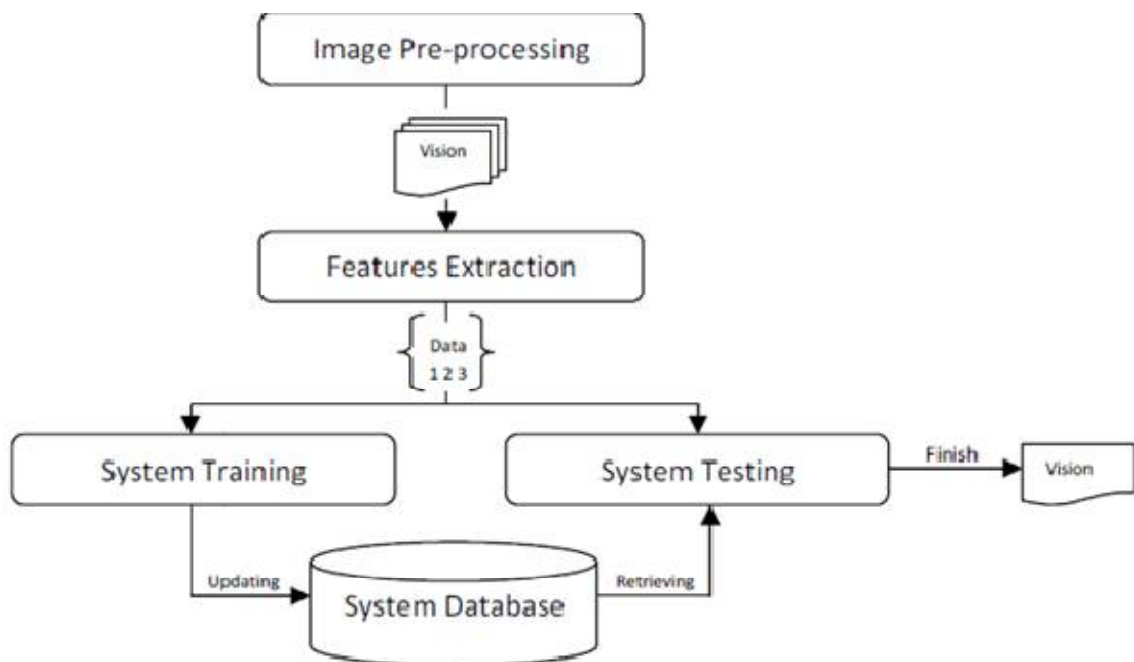


Fig 2 Architecture of gesture recognition system

In the another approach data glove are used for sign language recognition or sensor based recognition. This is due to availability of variety of sensors and scope of applications in real life. Many of researcher have started using these technique for gesture recognition. These advance technique of android platform can major backthrough in the field of Assistive Technology.

Assistive Technology is any device that helps a person with disabilities to complete an everyday task. Assistive technology can include mobility devices such as walkers , wheelchair as well as hardware and software. Assistive technology includes many specialized devices as well as typing telephones for people who are deaf and motorized wheelchair for people who can not walk. In Assistive technology include flex sensors and accelerometer to detect the bend in fingers and position of hands. It send the voltage reading to microcontroller which will be mapped to the text. Assistive technology can be critical for the person using it, if you wear glasses , think how it would be to get through the day without them.

III. PROPOSED SYSTEM

In this project data glove is implemented to capture the hand gesture of user. Talk glove is normal , cloth driving glove is fitted with flex sensors along the length of each finger and the thumb. The sensor output of data that varies with degree of bend . Following figure shows the proposed system archicheture of sensor based recognition.

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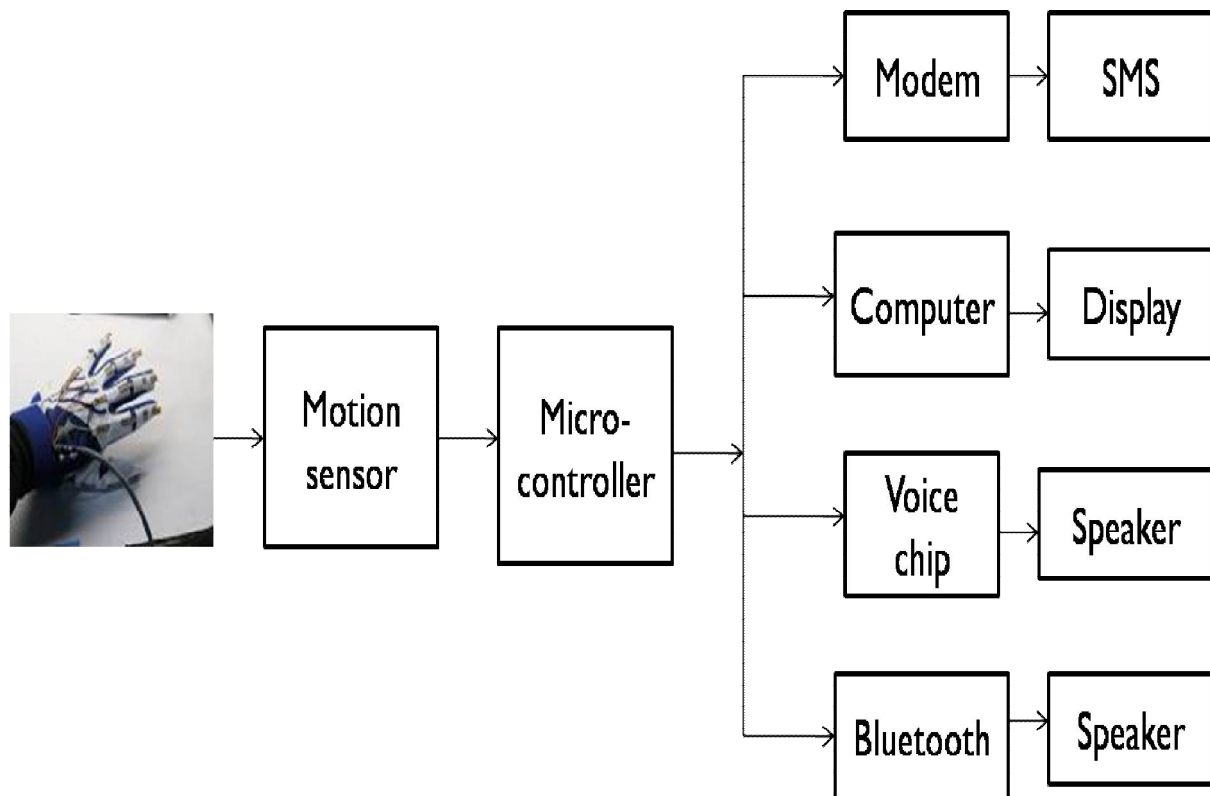


Fig 3 Block Diagram of Proposed System

The system mainly composed of several modules including the flex sensor, ATmega328 Microcontroller, modem, display, Bluetooth module and speaker. The first module flex sensor plays important role in this project. Flex sensor are sensor that change in resistance depending on the amount of bend on sensor. They convert the change in electrical resistance, the more bend more is resistance value. Inside flex sensor are carbon resistive element within thin substrate. The output of flex sensor is analog value, it is converted to digital and processed by microcontroller. After that it will be transmitted through wireless communication. Then it will be received in receiver section. In this system RF signal to transmit the signal. Also, we used a speech IC and speaker to produce the output. This system work on 5V supply via USB cable which are connected to computer for displaying the output.

The whole system si in following algorithm.

- Step 1: The flex sensor are mounted on the hand glove and the sensor can detect hand movement done by the person.
- Step 2: The sensor can convert these movement into electrical signal.
- Step 3: The voltage and resistance range for each movement is recorded and programmed in microcontroller as a Reference voltage
- Step 4: The output from sensor is given to microcontroller for comparison with reference voltage.
- Step 5: The sentence belonging to that range would be displayed on computer.
- Step 6: The entire system work on 5V supply via USB cable connected to the computer.

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1. FLEX SENSOR:

The flex sensor are analog variable resistance, they work as variable analog volatage divider. They are usually in form of a thin strip having length 1"-5" , width 0.25" and thickness upto 0.15".They can be made unidirectional or bidirectional as the size changes according to that resistance varies. Flex sensor operate 5V input voltage d output voltage 0 to 5V resistivity varying with sensor degree of bend and voltage output changing accordingly. It will be only change the resistance increase to 30-40K at 90 degree. The bending diagram of flex sensor as follows.

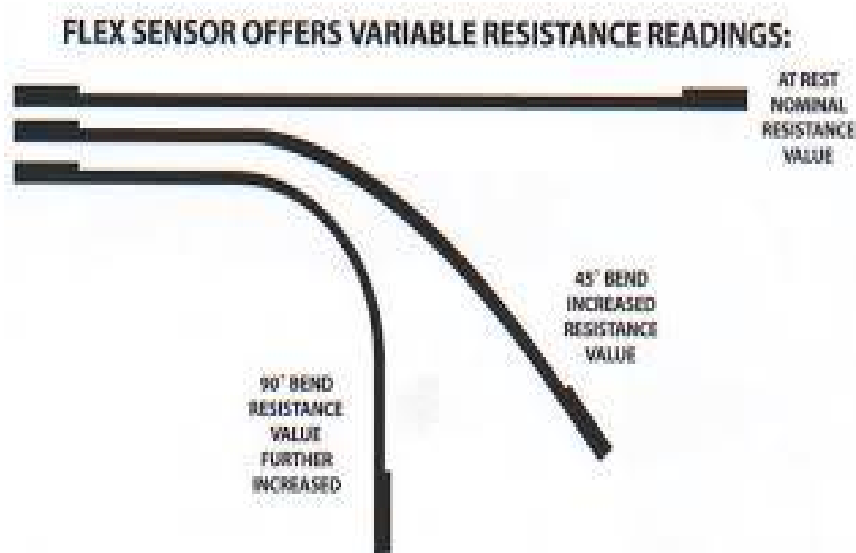


Fig 4 Bending Diagram of Flex Sensor



Fig 5 Flex Sensor image

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2. ARDUINO BOARD:

Arduino is a single board microcontroller intend to, make the application of interactive objects or environments more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Current models feature an USB interface, 6 analog input pins, as well as 14 digital I/O pins which allow attaching various extension boards. An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components to facilitate programming and incorporation into other circuits. Official Arduinos have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. In this system, The Arduino Duemilanove is a microcontroller board based on the ATmega168 or ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

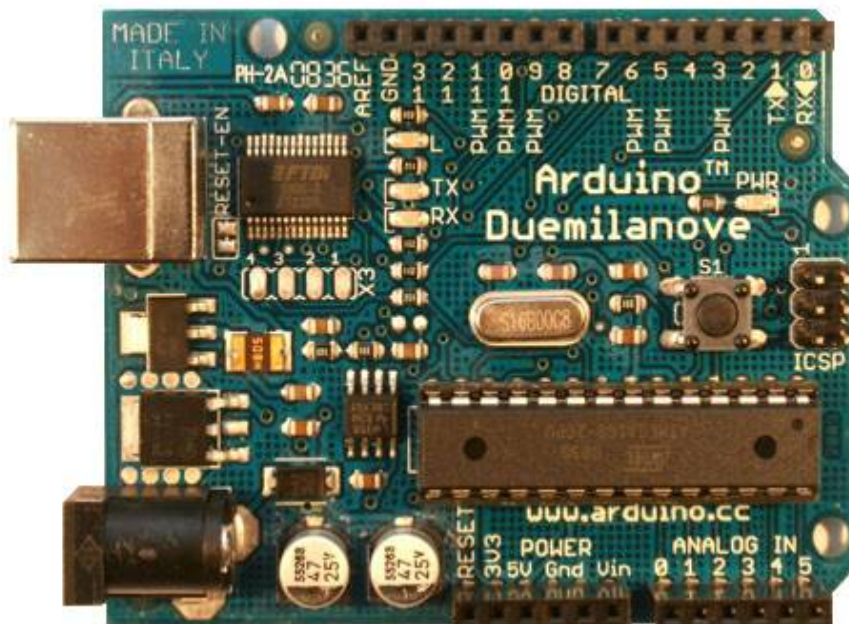


Fig 6: ARDUINO BOARD

IV. CONCLUSION

To make a communication bridge, a highly accurate, cost effective and an independent glove was designed for deaf mute people. The glove is capable focuses into speech through android phone. Smart glove focuses the translation of gesture into alphabet and some sentences.



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