



Implementation Of Speaking System For Physically Challenged (Deaf And Dumb) People Using Hand Gestures

Poojya Doddappa Appa College of Engineering , Kalaburagi

Department of Electronics and Communication Engineering

Name of Students:

Shailaja (3PD18EC073)

Siddu(3PD18EC081)

Sneha(3PD18EC082)

Sushil Gowdanoor (3PD18EC094)

Guide: Sri.S.K Aurad

Keywords:[Gloves, Flex Sensor, Register, Gesture recognition System, Arduino UNO, 16*2 LCD, Bluetooth HC05, Text to Speech Converter]

Abstract : Communication is the only medium by which we can share our thoughts or convey the message but for a person with disability (deaf and dumb) faces difficulty in communication with normal person. Because of this, a person who lacks in hearing and speaking ability is not able to stand in race with normal person. Communication for a person who cannot hear is visual, not auditory. Generally dumb people use sign language for communication but they find difficulty in communicating with others who don't understand sign language. So, there is a barrier in communication between these two communities. This work aims to lower this barrier in communication. The main aim of the proposed project is to develop a cost-effective system which can give voice to voiceless person with the help of Smart Gloves. It means that using smart gloves communication will not be barrier between two different communities. With the help of these gloves disabled person can also get chance to grow in their respective carrier. Using such devices by disabled person also makes nation grow. Smart hand gloves help physically disabled people to communicate with normal people. As Dumb person cannot speak then this smart glove helps him to convert this hand gesture into text or speech. This also help normal person to understand when he is trying to say and do accordingly this smart glove have facility of home appliance control from which a physically impaired person become independent to live the main objective or the implemented paper is to develop a reliable easy to use light weight. Smart hand gloves system which can minimize the obstacles for disabled people.

1. Introduction

Sign language is the language used by deaf and mute people and it is a communication skill that uses gestures instead of sound to convey 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. Flex Sensor Plays the major role, Flex sensors are sensors that change in resistance depending on the amount of bend on the sensor.

Here we propose a Smart Glove which will assist those people who are suffering for any kind of speech defect to communicate through gestures i.e., with the help of single-handed sign language the user will make gestures of alphabets. The glove will record all the gestures made by the user and then it will translate these gestures into visual form as well as in audio form. It uses ATmega328 micro-controller to control all the processes and flex sensors will track the movement of fingers.

2. Literature Survey

1.A device named Jhane Glove has been proposed under a paper named A Sign-to-Speech Glove a paper by Olga Katznelson, Solange Karsenty, Hadassah Academic College HaNeviim 37, Jerusalem, Israel 24-Feb-2014.

It has been built using three types of sensors which can be turned on and off. It has 5 flex sensors, accelerometer and gyroscope, and 8 contact pads. Each flex sensors have 3 states and enables 20 degrees of freedom which helps in making more than hundred different hand gestures.

The proposed has 26 alphabet signs, a space sign to mark the end of a word, and a dot sign to mark the end of a sentence. The system uses Arduino which helps in developing the pre-processing software in order to pre-process the data to be sent to our main agent i.e., a server-side component. The board is attached to the glove and in order to use the system, the user must first calibrate the glove. Initially the user must record the minimum and maximum values that can be emitted with the glove. But as the number of signs increases there is a gradual decrease in the accuracy of the sign recognition, which is the major drawback of the proposed system.

2.A sensory glove system has been proposed using LPC2148 Micro-controller in another Research Paper named Hand Gesture Recognition for Dumb People using Indian Sign Language given by Prakash B Gaiwad, Dr. V. K. Bairagi, Department of Electronics Engineering, All India Shri Shivaji Memorial Society's, Institute of Information Technology, Pune, Maharashtra, India published in Volume 4, Issue 12, December 2014 of 'International Journal of Advanced Research in Computer Science and Software Engineering'.

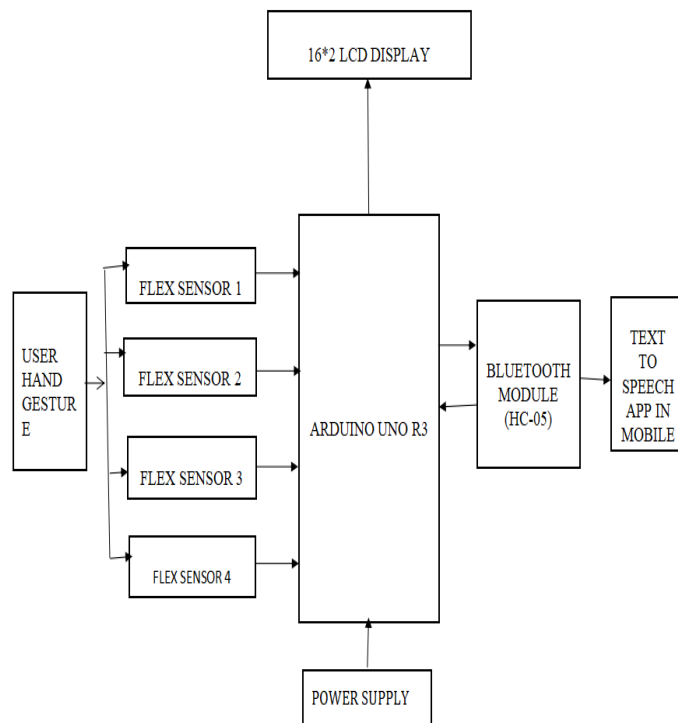
On each finger flex sensors are placed and are interfaced with the analog part. Digital ports are connected directly to accelerometer and contains circuit for signal conditioning. The Micro-controller receives and operates on the data for every individual gesture. It reads data from various sensors and transmits to the other Cell phone via Bluetooth module. With the help of a cell phone as a gesture recognition section, the predefined data is compared with the received data. If compared data is matched with predefined reading then matched gesture sent with text to speech conversion module.

3.Another paper titled "Sign language converter" by Tanner Arsan and Oghuz Ulgen Department of Computer Engineering, Kadir Has University, Istanbul, Turkey published in International Journal of Computer Science & Engineering Survey (IJCSSES) Vol.6, No.4, August 2015

Microsoft Kinect Sensor XBOX 360 is proposed for capturing abilities and technical features to the motion capture of sign to voice conversion. For voice to sign conversion CMU Sphinx is used. A java-based program is used to make voice recognition and motion capture and further it helps to convert both of them to each other. To let the Kinect sensor to process 3D scenes in any environmental light conditions, a 3D sensor combines infrared laser projector with a CMOS sensor. By using a grip of infrared light from projector on an area of any view, sensor receives from reflections of objects in the scene. Distance of object

surfaces from the visibility point of the camera specified by the depth map called as A Time of Flight. Gif images are used in the program to show the proper meaning for the recognized speech. Each word or word groups have a meaning on the Sign Language. The program can capture 12 motions and interprets them to the text.

3. Proposed Methodology



The above block diagram is the overall representation of Speaking system for physically challenged(Deaf and Dumb)people using hand gestures.

Hardware Requirements:

Flex Sensor: A flex sensor is basically a variable resistor that varies in resistance upon bending. Since the resistance is directly proportional to the amount of bending, it is often called a Flexible Potentiometer.

Flex sensors are generally available in two sizes: one is 2.2" (5.588cm) long and another is 4.5" (11.43cm) long. A flex sensor consists of a phenol resin substrate with conductive ink deposited. A segmented conductor is placed on top to form a flexible potentiometer in which resistance changes upon deflection. Flex sensors are designed to flex in only one direction – away from ink. Bending the sensor in another direction may damage it.

The conductive ink printed on the sensor acts as a resistor. When the sensor is straight, this resistance is about 25k. When the sensor is bent, conductive layer is stretched, resulting in reduced cross section (imagine stretching a rubber band). This reduced cross section results in an increased resistance. At 90° angle, this resistance is about 100KΩ. When the sensor is straightened again, the resistance returns to its original value. By measuring the resistance, you can determine how much the sensor is bent.

Arduino UNO R3:The Arduino UNO is a Micro-controller board based on the ATmega328 (data-sheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the Micro-controller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The UNO differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the UNO board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features:

1.0 pin-out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

Bluetooth module:HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and base band. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle. It has 6 pins,

1. Key/EN: It is used to bring Bluetooth module in AT commands mode. If Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC-05 in command mode is 38400bps and 9600 in data mode.

HC-05 module has two modes

1. Data mode: Exchange of data between devices
2. Command mode: It uses AT commands which are used to change setting of HC-05. To send these commands to module serial (USART) port is used.
2. VCC: Connect 5 V or 3.3 V to this Pin.
3. GND: Ground Pin of module.
4. TXD: Transmit Serial data (wireless received data by Bluetooth module transmitted out serially on TXD pin)
5. RXD: Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
6. State: It tells whether module is connected or not.

16*2 LCD Display:Liquid crystal display (LCD) has material which joins together the properties of both liquid and crystals. They have a temperature range within which the particles are essentially as mobile as they might be in a liquid, however are gathered together in an order form similar to a crystal.

The LCD is much more informative output device than a single LED. The LCD is a display that can easily show characters on its screen. They have a couple of lines to large displays. Some LCDs are specially designed for specific

applications to display graphic images. 16x2 LCD (HD44780) module is commonly used. These modules are replacing 7-segments and other multi-segment LEDs. LCD can be easily interfaced with Micro-controller to display a message or status of the device. It can be operated in two modes: 4-bit mode and 8-bit mode. This LCD has two registers namely command register and data register. It is having three selection lines and 8 data lines. By connecting the three selection lines and data lines with the Micro-controller, the messages can be displayed on LCD.

Software Requirements:

Arduino IDE

Arduino is a type of computer software and hardware company that offers open-source environment for user project and user community that intends and fabricates Micro-controller-based inventions for construction digital devices and interactive objects that can sense and manage the physical world. For programming the Micro-controllers, the Arduino proposal provides a software application or IDE based on the Processing project, which includes C, C++ and Java programming software. It also supports for embedded C, C++ and Java programming software.

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures Micro-controller-based kits for building digital devices and interactive objects that can sense and control the physical world. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the Micro-controllers, the Arduino platform provides an integrated development environment (IDE) based on the Processing project, which includes support for C, C++ and Java programming languages.

An Arduino board consists of an Atmel 8, 16 or 32-bit AVR Micro-controller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²C serial bus so many shields can be stacked and used in parallel. Official Arduino have used the mega AVR series of chips, specifically the ATmega8, ATmega168.

An Arduino's Micro-controller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer. Currently, Opti boot loader is the default boot loader installed on Arduino UNO. An Arduino's Micro-controller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an

Arduino more straightforward by allowing the use of an ordinary computer as the programmer.

Working:

Arduino is an open-source computer hardware and software company. A Micro-controller board contains onboard power supply, USB port to communicate with PC, and an Atmel328 Micro-controller chip. A glove is used to fix the flex sensor to detect the sign language input to the Micro-controller to process the gesture output as speech as well as displays in LCD. The power supply section is in-built in the Arduino board in different power source input. First one is power adaptor input and second is 6 UNNI USB input and it will act as a serial communication with computer system and program dumping port. A 16x2 LCD display is used to displays the gesture patterns. The displaying message is also announced as a voice using Text to speech converter app. The text which is displayed on LCD is playback when the particular gesture is detected corresponding voice is announced in speaker.

The work starts from movement of hand gloves where the 4 flex sensors flex 1, flex 2, flex 3, and flex 4 are attached, and the value of sensor changes when its experiences the bending. The flex sensor is another type of potentiometer attached to the fingers, when we bend the finger the value of the sensor gets changed. The changing value of the sensor is dependent upon the resistance and applied angle of the bending, when we bend the sensor at some particular angle, we can see the value of the resistance is increase and accordingly the output gets reduced. On the other way, we can say that it's like an inversely proportional when the resistance of the sensor is increase at that instant the value of output decreases and accordingly. Based on bending of flex sensor the Arduino UNO read the code and based on angle(ex: if 45degree bend it displays as "I need food") and displays the output on 16*2 LCD display and further with the help of Text to speech converter app the text is converted into speech.

4.Advantages & Disadvantages

Advantages

1. A gesture-based circuit is used for speechless patient & physically challenged people.
2. pre-determined gesture is used to express their thoughts and announced as voice.
3. A flex sensor is used to detect the expression and processed by Micro-controller.
4. It is requiring fewer components so its cost is low.
5. Small in size; due to small size we can place its hardware on our hand easily.

Disadvantages

1. Accuracy and processing of system may be slow.
2. We may have some difficulty in operating the glove.
3. These gloves cannot capture the facial expression.
- 4.Many deaf people may not want to carry around the glove or may find that the computer processing is too slow or unnatural.

5. Application

1. Useful for Physically challenged peoples.
2. Conveying information related operations
- 3.Provides easy communication between the speech impaired people and the natural people.

6.Conclusion

As a sign language is a method to convey the thoughts of Deaf and Dumb people, this system will make that medium more reliable and helpful. Here, the system will convert the sign language into text as well as speech, using these Gloves. In order to improve and facilitate the more gesture recognition, we have added the option to add more Gestures into the database.

Acknowledgement

We express our deep sense of gratitude and indebtedness to my esteemed institute "P.D.A COLLEGE OF ENGINEERING" KALABURAGI which has provided us an opportunity to fulfill the most cherished desire to reach our goal. We express our foremost gratitude to our guide Sri.S.K Aurad for constant support and valuable guidance.We are thankful to Dr.G S BIRADAR Professor and Head of the department of Electronics and Communication engineering, for giving permission to carry out this project in the college.

4. References

- [1] Sign Language Structure: An Outline of the Visual Communication Systems of the American Deaf by William C. Stokoe, Jr.Gallaudet University.
- [2] American Sign Language: Roots and History - Geoffrey Poor.
- [3] "Computer technology education and the deaf student: observations of serious nuances of communication" by Curtis Robbins, Gallaudet University published in 1996.
- [4] "The Academic Status of Sign Language Programs in Institutions of Higher Education in the United States" by Sheryl B. Cooper.
- [5] A Sign-to-Speech Glove a paper by Olga Katzenelson, Solange Karsenty, Hadassah Academic College HaNeviim 37, Jerusalem, Israel. 24-Feb-2014

[6] Prakash B Gaikwad, Dr. V.K. Bairagi,” Hand Gesture Recognition for Dumb People using Indian Sign Language”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 12, December 2014.

