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Hand Gesture Vocaliser for Deaf

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Abstract -Deaf-mute humans need to talk with regular human beings for their everyday ordinary. The deaf-mute people use sign language to talk with other humans. However, it is viable simplest for the ones who have passed through unique training to recognize the language. Sign language uses hand gestures and different means of non-verbal behaviours to deliver their supposed meaning. It includes combining hand shapes, orientation and hand actions, hands or body movement, and facial expressions concurrently, to fluidly explicit speaker's thoughts.

The project is based on the need of developing an electronic glove that can translate sign language into speech in order to lower the barrier in communication between the mute communities and the normal people.

A Wireless electronic gloves is used, which is everyday material driving gloves fitted with flex sensors along with the every finger. Mute human beings can use the gloves to perform hand gesture which can be converted into speech in order that regular humans can apprehend their expressions.

Human beings have interaction with each other to deliver their ideas and reviews to the people around them. But this isn't always the case for deaf-mute people. Sign language paves the manner for deaf-mute people to communicate. Through signal language verbal exchange is feasible for a deaf-mute person without the manner of acoustic sounds.

Thus, in order to bridge this gap, this project intends to implement a real-time video processing-based speech assistant system for the speech impaired

I. INTRODUCTION

Historically the term deaf-mute is either the person who can speak but is unable to hear or both i.e deaf and unable to talk. Deaf humans face many irritations that restrict their ability to do their duties.

Communication is the most fundamental and critical shape of interplay with each person for this reason for interacting with deaf and dumb humans sign language or gestures are used.The dumb humans use their general signal language which isn't always effortlessly understandable by using commonplace humans. Also there's no standardised sign language defined internationally. Vocalisers convert the sign language into voice that is without problems understandable through blind and everyday people.

Gesture Vocalizer is a tool that's being designed to permit the communication of various deaf and blind societies and their conversation with the regular humans. The system may be dynamically reconfigured as a clever tool that may work for all styles of sign languages. Gesture vocalizer is essentially a data glove and a microcontroller that can stumble on nearly all of the movements of a hand and convert a few certain moves into human recognizable voice.It is based on making an electronic device that could translate sign language into speech so as to make the communication take place between the mute communities with the overall public viable.

The main components used here are flex sensors, gloves, LCD display, and Arduino UNO speech synthesis. Features and the architecture of the Arduino UNO Is explained in the next section.Flex sensor is largely a variable resistor whose terminal resistance increases whilst the itis bent. So this sensor is used to sense the changes in linearity. LCD is a flat panel display technology commonly used in TVs and computer monitors. It is also used in screens for mobile devices, such as laptops, tablets, and smartphones. A USB cable is used to upload then program to Arduino UNO. A Bluetooth module is used here to communicate with the mobile phones. The gloves consists of flex sensors attached to every finger of the glove to sense the detection of the bending. The bending of the fingers is detected and as programmed the for particular combinations of the input given to the Arduino the respective output will be shown. When you want to measure the flex or bent or angle change of any instrument the flex sensor internal resistance changes almost linearly with its flex angle.

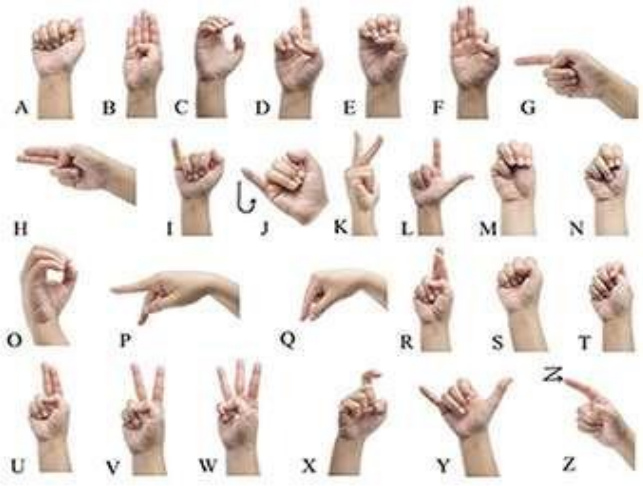

Fig. 1: Indian Sign Language

II. PLANNED SYSTEM

Fig. 2: Block diagram

Block diagram of hand gesture vocalizer for deaf is as shown in Fig-2. The device has hardware and software program. Hardware part consists of flex sensors, Arduino, LCD display, Bluetooth module. Software consists of the programming of Arduino in keeping with the gestures. This gadget is split into three elements:

- Gesture enter
- Processing the records
- Voice output using smartphone
  - **Gesture input:**Sensors are located at the hand of deaf human beings which converts the parameter like finger bend hand position perspective into electrical sign and provide it to Atmega 328 controller and controller take movement in line with the signal.
  - **Processing the records**: The output of flex sensors is converted into digital form by using inbuilt analog to digital converter of Arduino UNO. Predefined gestures with corresponding messages are saved in the database of the microcontroller. Arduino UNO checks whether the enter voltage from the flex sensors exceeds the edge price this is stored inside the database.
  - **Voice output using smartphone**:The output from the Arduino is sent to LCD and smartphone via Bluetooth module. LCD displays the message that is assigned to the gesture within the program. Speech signal is produced using text to speech converter application through mobile phone.

III. HARDWARE COMPONENTS REQUIRED

A. ARDUINO UNO:

Arduino UNO is a microcontroller board based on ATmega328P. It consists of 14 virtual input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a sixteen MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It incorporates the whole lot needed to assist the microcontroller; truly join it to a pc with a USB cable or power it with a AC-to-DC adapter or battery to getcommenced.

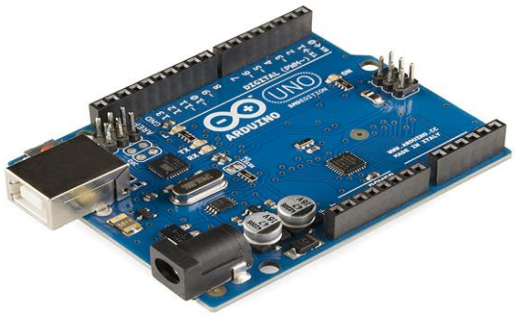

Fig. 3: Arduino UNO

B. FLEX SENSORS:

Flex sensors (Fig-4) are the sensors that degree the amount of deflection or bending. They act as the supply of input to the microcontroller.

Fig. 4: Flex sensor

C. LCD 16×2:

Liquid Crystal Display (Fig-5) display is an electronic device. A 16x2 LCD presentations 16 characters according to line and there are 2 such strains. This LCD includes Command registers and Data registers. The command registers keep the command commands given to the LCD. The information registers shops the records to be displayed on the LCD. It is used for consumer interface.

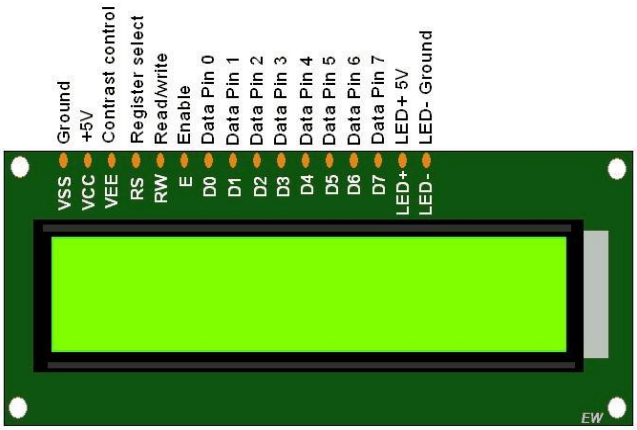

Fig. 5: LCD

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D. BLUETOOTH (HC-05):

HC-05 is a Bluetooth module(Fig-6) that is designed for wireless communication. This module can be used in a grasp or slave configuration. Bluetooth serial modules allow all serial enabled gadgets to speak with each other the use of Bluetooth.

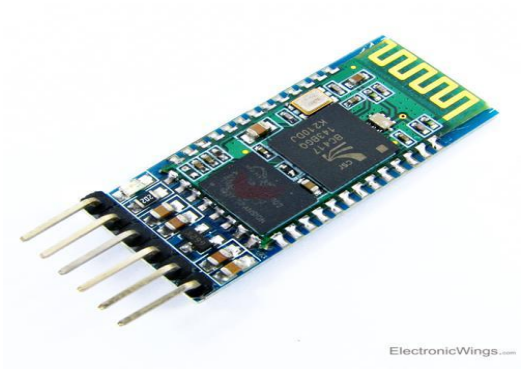

Fig. 6: Bluetooth HC-05

SOFTWARE REQUIRED

E. ARDUINO IDE:

Arduino UNO is a microcontroller board based on the ATmega328p. It has 14 digital input/output pins (which 6 can be used as PWM outputs), and six analog inputs , 16MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button and power by a AC to DC adapter or battery to get started.

IV. CIRCUIT DIAGRAM

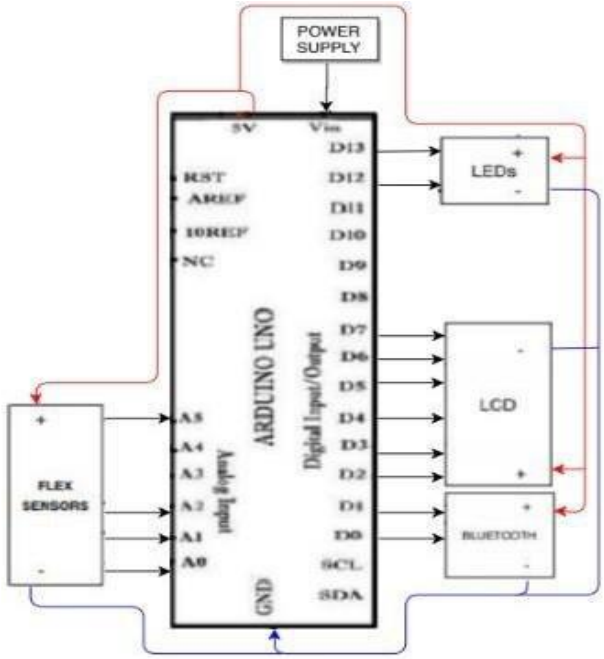

Fig. 7: Circuit Diagram

A. GLOVES:

The gloves consist of the flex sensors attached to every finger of the gloves to sense the detection of bending in the fingers taking into account the change in the value of the resistance caused due to the bending of the fingers accordingly.

B. FLEX SENSORS:

Flex sensors are usually available in two sizes. One **is** 2.2 inch and another is 4.5 inch . Although the sizes are different the basic function remains the same. They are also divided based on resistance. When you need to degree the flex or bent or angle the flex sensor inner resistance modifies nearly linearly with its flex attitude.

So the flex sensors also called as flexible potentiometer is fixed on the gloves to detect the bend in the fingers of the user.

C. ARDUINO WITH GESTURE DETECTION:

We are using Arduino UNO for interfacing all the hardware such as LCD , Flex sensors and Bluetooth .By using the IDE software we have programmed the particular set of combinations for taking the input caused due to bending of flex sensors and give visual and audio output from the LCD and the Bluetooth device by interfacing with Arduino.

D. *LCD MODULE*:

We have used 16x2 LCD displays where we can give visual output till 32 characters. The LCD display is interfaced with the Arduino UNO board and the particular combination that is proposed will be displayed when the user uses the glove.

E. SPEECH SYNTHESIS:

We have used a Bluetooth module which is interfaced with the Arduino UNO which will give an audio output using the smartphone device according to the input given by the user.

V. WORKING PRINCIPLE

- TheGesture vocalizer for deaf & mute people interaction some sensors are placed on the hand of deaf people which converts the parameter like finger bend hand position angle into electrical signal and provide it to Atmega 328 controller and controller take action according to the signand transformed into matching speech and displayed on LCD.
- The text output from the Arduino is sent to LCD and smartphone through Bluetooth module. LCD shows the message that is apportioned to the gesture in the program. Speech signal is produced using text to speech converter application through mobile phone.

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VI. FLOW CHART

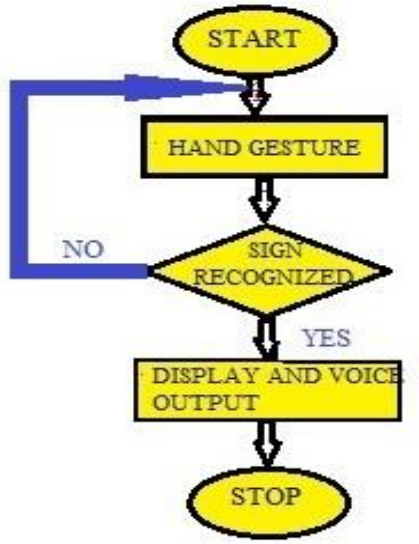

Fig. 8: Flow Chart

- The user makes the shape of required sigh the gesture input is given to the Arduino.
- As we have placed sensors on gloves which are used by the deaf person, so whenever he/she has to say something he/she will just make the sign and accordingly the flex resistance changes and produces the corresponding output which will be shown by the display and speech using smartphone.
- Arduino UNO matches the motion within the program and produces the text output which is then sent to mobile phone using Bluetooth module HC-05 in which the application converts the text into speech and produces the voice output

VII. IMPLEMENTATION AND RESULTS

- Fig ix shows the setup of the whole project, where the LCD display, Bluetooth module is interfaced to the Arduinoboard.
- Microcontroller is programmed accordingly using the Arduino IDE software
- Four flex sensors are connected to the Arduino board, the Bluetooth module is connected to the Bluetooth app using smartphone to provide the audio output.
- Fig 10 shows the smartphone result.
- Fig 11 shows some gestures with parallel messages

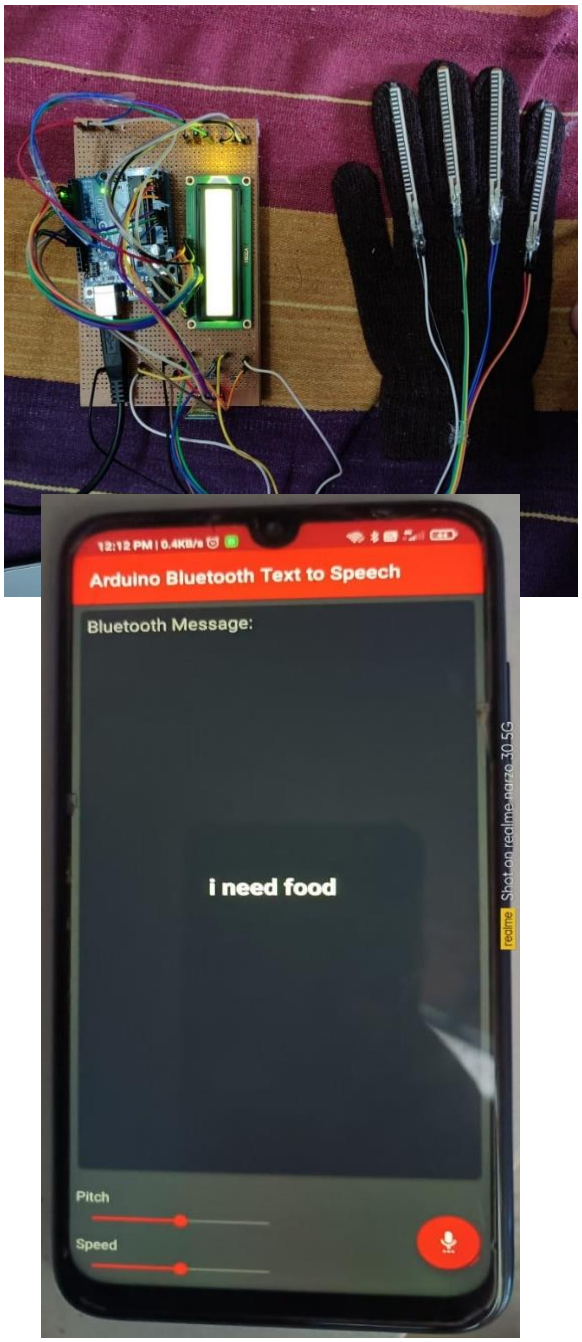

Fig.10: Smartphone Result

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SL. NO	GESTURE INPUT	OUTPUT
1.		
2.		
3.		
4.		

Fig. 11: some gestures with parallelmessages.

VIII. APPLICATIONS, ADVANTAGES AND CHALLENGES

A. *APPLICATIONS*

- It can be used by the Deaf and Dumb community in order to increase the interaction in the society.
- The prototype can further be developed for the people who are paralyzed because of stroke or accident, in order to help them easily communicate with little effort.
- The device functionality can be expanded to increase automation functions so as to make the life of people who are physically challenged easy.

B. *ADVANTAGES*

- It is a social motive project.
- Deaf people can easily talk with ordinary people.
- Implementation is Easy.
- Provides Audio as well as Visual output

C. *CHALLENGES*

- One of the major drawbacks of the project (i.e.., Hand Gesture Vocalizer) is that the sensors are very sensitive and can cause varied amount of variation in their output values at the time of the bend.
- The cost of the Sensors is also a problem, as little pressure on the sensors can cause the sensor to burn and would require replacement.

IX. CONCLUSION AND FUTURE SCOPE

A. *CONCLUSIONS*

The design and implementation of Hand Gesture Vocalizer For Deaf System proved to be a challenging, rewarding and exciting experience. While keeping the objectives of the course in mind, we were able to successfully complete the integration of Hand glove using hardware components like sensors, Arduino UNO, Bluetooth and software (Arduino IDE. Since the project is Arduino UNO based Smart feature and automations that can be configured for different applications easily.

The project is designed primarily to be used by Deaf people to help them communicate with regular people easily.

B. *FUTURE SCOPE*

The further enhancements which can be made in the Hand Gesture Vocalizer for improved functionality are as follows

- Inclusion of more gestures can be made possible by using advanced microcontrollers like Raspberry Pi Or even more advanced software which could possibly include image processing which may analyses the hand movements of the Deaf & Dumb language and give better result.
- The Automation can be made to include even more functionalities which could possibly help control all the equipment in a house/working facility. It can be made more compact and portable for easy carry and use. It can be further integrated with mobile device for improved communication during its use.

REFERENCES

[1.] Syed Faiz Ahmed, Syed Muhammad Baber Ali, Sh. Saqib Munawwar Qureshi, “Electronic Speaking Glove for Speechless Patients A Tongue to a Dumb”, IEEE Conference on Sustainable Utilization and Development in Engineering and Technology, pp. 56-60, 2010,

[2.] Conference Paper (PDF Available) · February 2008 Conference: Proceedings of the 7th WSEAS International Conference on Signal Processing, Robotics and Automation

[3.] Kazunori Umeda Isao Furusawa and Shinya Tanaka, “Recognition of Hand Gestures Using Range Images”, Proceedings of the 1998 IEEW/RSJ International Conference on intelligent Robots and Systems Victoria,

[4.] Sushmita Mitra and Tinku Acharya,”Gesture Recognition: A Survey”, IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS— PART C: APPLICATIONS AND REVIEWS, VOL. 37, NO. 3, MAY 2007, pp. 311-324

[5.] Jean-Christophe Lementec and Peter Bajcsy, “Recognition of Am Gestures Using Multiple

Orientation Sensors: Gesture Classification", 2004 IEEE Intelligent Transportation Systems Conference Washington, D.C., USA, October 34, 2004, pp.965-

[6.] Seong-Whan Lee, "Automatic Gesture Recognition for Intelligent Human-Robot Interaction" Proceedings of the 7th International Conference on Automatic Face and Gesture Recognition (FGR'06) ISBN # 0-7695-2503-2/06