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Electronic – Speech For Deaf And Dumb Using Arduino Mega 2560

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ABSTRACT: Few people can't speak, or they lose it in an accident ad those people find it difficult to express their thoughts or to convey their message to other people. In this project, we have come up with a Sign Language Glove which will assist the people who are suffering from any kind of speech defect to communicate through gestures which will help of single-handed sign language the user will make gestures of alphabets or words. The glove will record all the gestures that will be made by the user and then it will translate these gestures into visual on-screen form as well as in audio form. This project uses the Arduino controller to control all the processes and flex sensors. An LCD and speaker are used. An LCD will be used to display made by the user's gesture and a speaker to translate the gesture into an audio signal is planned if possible for execution.

KEYWORDS: Arduino mega 2560 , Flex sensor, APR 33A3, Speaker, NodeMCU, LCD.

I.INTRODUCTION

Talking hands is a pair of gloves, which is capable of recognizing the signs (Indian sign language) made by our hands, and converts it into a form of speech, which helps speech-impaired people communicate with others implemented through Arduino programming and a Smartphone application. Sign languages are not easy to recognize as they are difficult to understand and also highly complex to learn. The day to day functioning of people with disabilities as well as their independence can be developed and improved by the use of products based on Assistive Technology. A cogently operating sign language recognition system can provide a room for a speech challenged person to communicate with non-signing people without the need of a decoder. It can be used to accomplish speech or text, making the mute more self-dependent. Sadly, there hasn't been a system with these facilities so far. All research till now has been restricted to small scale systems competent in recognizing only a nominal subgroup of a full sign language. However, these systems have not been effective enough to make them independent.

Technology is always a great help for people. And it has always been a help to the disabled and given them a helping hand to allow them to live a normal and healthy life like others. Here we have come up with an idea of a glove named Hand talks that will convert hand movements into text and allow the deaf to express themselves. The glove needs to be worn on the hand by the deaf or mute person and depending on the difference of movement; the device will convert it into a voice for the other person to understand it easily. The glove senses the movements through the flex sensors which detect the different variations or patterns of motion and the way the finger curls. The device can sense each resistance and each movement made by the hand. Currently, the device can convert only a few words, but depending on the device few more additional words may be added later onto this expressive system.

The glove will record all the gestures made by the user and then it will be translated to the gestures into a visual form as well as in audio form. The Gestures can be converted to voice by using APR9600 Voice storage and retrieval chip. Pre-recorded voices are stored to APR memory and when similar gestures are received, the appropriate voices are reproduced by the APR through the speaker.

II. LITERATURE SURVEY

Smart gloves are proposed in recent years when preferred technology was wireless mode with many obvious features, but those were not constant, lightweight, cheap, easy to use, plug, and play type prototypes. It is because of components

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used for fabrication which are normally available in the market flex sensors, microcontroller, and wireless transmitter, and these were powered by a battery which was a little heavy as compared to other components. Therefore, these kinds of assemblies are bulky and difficult to use. In an attempt to open up the lines of communication and to start a conversation between people who are hearing-impaired or have trouble in speaking, a student and designer at Goldsmiths University in London have developed a smart-glove named "Sign Language Glove" which is capable of translating sign language from hand gestures made by the user into a visual on-screen data or text as well as audio. Advantages and disadvantage are as follows:-

- It is wireless with displays and voice devices.
- It is portable.
- It is bulky in wearing.
- Difficult to handle.
- It is delicate and components are expensive.

III.PROBLEM STATEMENTS

Problems faced by the disabled person regarding employment can be overcome by our method. So in the implemented work, an intelligent microcontroller-based system using Flex sensors is developed which is able to-Convert gesture into voice and text. Help a person to control his home appliances if he could not walk to the switchboard. Nowday's technology wireless gloves are not reliable because to be used as wireless, the gloves should have an inbuilt battery and some electronics controller or circuit boards which may cause irritation and heavy. The technology is developing day by day but no significant developments are undertaken for the betterment of impaired people. Communication between deaf-dumb and normal people has always been a challenging task.

Sign language helps deaf and dumb people to communicate with each other people. Gestures are the most natural expressive way for communications between impaired people and normal persons.

IV.METHODOLOGY

The system to be implemented, the following requirement of different modules was considered as the independent blocks for operation.

1. Input sensors for Hand Gesture Recognition.

2. Signal Conditioning for Data Compatibility

3. Microcontroller for Data Process and Action.

4. Display and menu Device for Data.

5. Voice IC for the audio record.

6. Audio Amplifier for Boosting Audio Level.

7. Speaker for Audio Output.

This method has both hardware and software.

Hardware part includes flex sensors, Arduino, LCD, language selection switches, panic switch, and NODMCU module. The software includes the programming of Arduino corresponding to the gestures. In this project, a glove is implemented to capture the hand gesture made by the disabled person and converting it into speech as well as text.A microcontroller is used for different functions like (AD) analog to digital conversion of data from flex sensors. Then digitized data is encoded in the encoder and transmitted. Received data is decoded by the decoder and the gesture recognition system matches the incoming data with pre-feeded data. If the user's data is matched then it is given to the speaker using the voice section.

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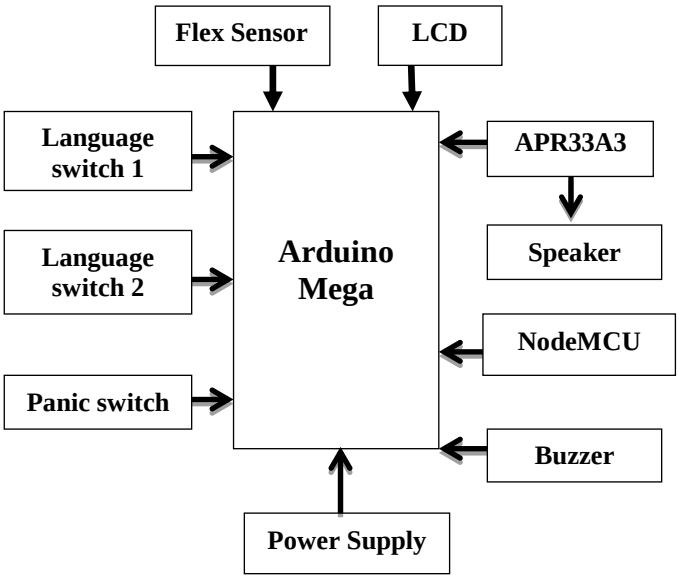

Fig: Block Diagram

V. REQUIREMETS

Hardware Components:

1. Arduino Mega 2560:

The Arduino Mega 2560 is a microcontroller based on the ATmega 2560. It has 54 digital I/O pins i.e. of which 14 can be used as PWM outputs, 16 analog inputs, 4 UARTs hardware serial ports, 16 MHz crystal oscillator, USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply we connect it to a computer with a USB cable with an AC-to-DC adapter or battery to get started.

Fig 1: Arduino Mega 2560

2. Flex Sensor

Here flex sensor plays a major role and it is an input sensor. The bending angle increases the resistance of the flex sensor also increases and this will be converted into voltage change by connecting a flex sensor to a potential divider circuit.

Fig 2: Flex Sensor

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3. LCD (Liquid Crystal Display) 16×2

A 16×2 LCD is a basic module and very commonly used in various devices and circuits. 16 mean it can display 16 characters per line and 2 mean 2 such lines.

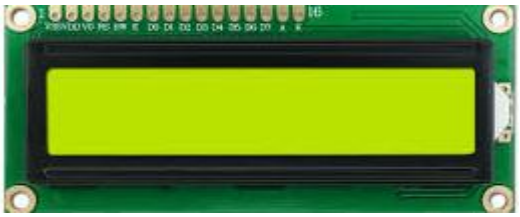

Fig 3: LCD 16×2

4. APR 33A3 (Auto Playback Recorder):

The APR33A3 series (Auto Playback recorder) is a powerful audio processor with high-performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs).

Fig 4: APR 33A3

5. Speaker

It is the output device, and they are transducers that convert electromagnetic waves into sound waves.

Fig 5: Speaker

6. NodeMCU

It is an open-source Lua based firmware and development board targeted for IoT based applications. It includes firmware that is used to run user programs on the device and can be thought of as the software that allows hardware to run on the ESP8266 Wi-Fi SoC and hardware which is based on the ESP 12 module.

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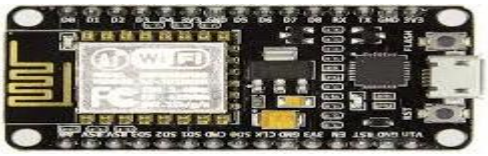

Fig 6: NodeMCU

7. Buzzer

A buzzer is an audio signalling device, which is or may be mechanical, electromechanical, or piezoelectric. It includes timers, alarm devices, and confirmation of user input.

Fig 7: Buzzer

8. Push-button switch

A push-button is a type of switch that controls the action in a machine. Most of the buttons are plastic or metal.

Fig 8: Switch

Software components:

1. Arduino IDE:

The Arduino Integrated Development Environment (IDE) is a cross-platform application that is written in functions from C and C++ Language. It is easy to write code and upload it to the board.

2. Telegram application:

Telegram is a messaging app that is fast, simple, secure, and free. It has an open API (Application program interface) and protocol free for everyone.

VI. RESULTS AND DISCUSSION

- Each finger when bent at an angle of 45 degrees or more than that, the gesture is recognized by the database of the microcontroller.
- Each gesture has a unique message align to it.
- The same message is given as output to the speaker and also to LCD.
- The working sensor is displayed on the LCD as a message i.e., is I want some water, how are you, etc.,
- The panic switch is used to send the message to the caretaker that the person is in need.
- Node MCU is used to send the message to the caretaker through a telegram application.

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Fig 9: Result

VII. ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Small
- Lightweight.
- Flexible to users.
- Less power to operate the system
- Easy to operate
- Easy to define gestures
- Communication is possible in any language.
- It requires fewer components
- The cost is low.
- Delay time is less than the earlier system proposed.
- An effective way of communication for physically challenged people.

DISADVANTAGES:

- Facial expressions are not considered.
- Flex sensors are sensitive and to implement a system with more gestures is difficult.

VIII. APPLICATIONS

- Physically challenged persons
- Communication between the mute peoples or impaired people and the normal peoples
- Conveying information related operations
- Medical application
- The user can record voice in any language and the facility is provided for the selection of the desired language through which he/she likes to communicate with others.
- Panic switch helps in tracking the location of the user in an emergency

IX. CONCLUSION

This paper introduces the Smart Hand Gloves for disabled people or impaired people. It will provide a more secure, efficient, easy to use, and lightweight solution to the user as compared to other proposed papers. This will create meaning for the lives of disabled people. During this project, we face different types of challenges. We have tried to minimize the problem. One problem is there to make it Wireless. So, here we observed and analysed some different research papers and products available in the market which are bulky, difficult of the handle, and thin in structure. Since this was a prototype we focused ad we were able to build a model, which can solve or minimize the communication problem for disabled people. We have minimized the communication problem as:

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- The output is in the form of speech which is easily understood by others.
- This system will assist the speechless people to express their needs using gestures.
- The voice output can be manipulated in any language according to the user.

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