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SIGN CONVERSION FOR MUTE COMMUNITY USING GESTURE AND FLEX SENSORS

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ABSTRACT

Generally dumb people use sign language for communication but they find difficulty in communicating with others who don't understand sign language. This project aims to lower this barrier in communication. It is based on the need of developing an electronic device that can translate sign language into speech in order to make the communication take place between the mute communities with the general public possible. A Wireless data gloves is used which is normal cloth driving gloves fitted with flex sensors along the length of each finger and the thumb. Mute people can use the gloves to perform hand gesture and it will be converted into speech so that normal people can understand their expression. Sign language is the language used by 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.

Keywords: Gestures, Arduino UNO, Flex sensors, APR33A3 Voice Module.

1. Introduction

In the recent years there has been a rapid increase in the number of hearing impaired and speech disabled victims due to birth defects, oral diseases and accidents. When a speech impaired person speaks to a normal person, the normal person finds it difficult to understand and asks the deaf-dumb person to show gestures for their needs. Dumb person has their own language to communicate with us; the only thing is that we need to understand their language. The language used by the deaf and dumb people for their communication is known as sign language. The sig language, so the communication becomes very difficult. In emergency or other times when a mute person travelling or among new people communication with nearby people or conveying a message becomes very difficult. Here we propose a smart speaking system that helps mute people in conveying the message to regular people using hand motions or gestures. People who are deaf and dumb often tend to feel uncomfortable around other people, when drawing attention to their hearing problem. Those people want to be like their friends with good hearing, so this drives a thought in them to mainly keep to themselves and to not take part in activities with those normal people. Sign languages are used by mute people as a medium of communication. Sign languages are used to convey thoughts with symbols, and objects etc. They also convey combination of words and symbols (i.e. gestures). Gestures are different patterns made by the curls and bends of the fingers. Gestures are the best medium for their communication As we tend to all grasp that communication plays a really outstanding role in our human lives. At this gift innovative world, there square measure most of individuals World Health Organization (WHO) square measure deaf and dumb ought to have a tiny low dream on communicate as traditional people with others is not a straight forward task. An electronic glove is developed for deaf-mute communication interpreter system that helps out the deaf and dumb individuals to speak with dependability. Here only 1 hand is employed. There are four flex

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detectors are employed and every square measure fitted with length of every finger of glove. The hand gesture plays a key role. The gestures are decoded by microcontroller. By every specific gesture (i.e. creating completely different positions of fingers) of the flex sensors. In this paper, ATMEGA328 is used to take input from flex sensors all the data from ATMEGA328 is sent to android phone and accordingly the android phone will speak the corresponding Sentence which has been allotted to particular gesture value. The work that related to the project such as of gesture recognition that plays a key role. In this one of the methods is glove based systems. The extra sensors make it easy to collect hand configuration and movement. However, the devices are quite expensive and bring much cumbersome experience to the users some of the earlier gesture recognition systems attempted to identify gestures using glove-based devices that would measure the position and joint angles of the hand is studied from references. This Gestures which are come from ATMEGA328 board the IOT module send that sign to Android phone.

The main aim of this paper is to facilitate people by means of a glove based communication interpreter system. 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 is a stream of data that varies with degree of bend. The output from the sensor is analog value and 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 paper flex sensors plays the major role, Flex sensors are sensors that change 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.A single standard, universally accepted scheme does not exist for Sign Language. When India ratified the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), India made a promise to the world that she would ensure that dumb and deaf people will be treated equally and will enjoy the same rights as other Indian citizens. But the absence of such a common sign language model proves to be a roadblock in the efforts to treat the Deaf and speech impaired people equally. It was the above factors which prompted to address this key issue through this project. Thus, was conceptualized the Gesture Vocalizer.

2. Literature Survey

Navaitthiporn, Nitipon, et al (2019)[1] proposed a hand glove for deaf and mute people to provide better communication between disabling and normal people. We applied computer programming by used the flex sensor and GY-521 Module. The flex sensor has measured the bent of fingers and generated an analog output. GY-521 Module is use for measured the direction and movement of the hand. After got data from both sensors, it will send to Arduino IDE converted all the data to alphabet and text before converted to speech. Then we tested the accuracy of the glove, it has accuracy about 70 - 100% which depends on another factor. From this process, we got a hand glove for sign language communication. This glove will help deaf and mute people to communicate more efficiently. Sohelrana, Khan, et al (2020)[2] proposed earlier hand gesture device was developed by numerous ways, Anagha J. Jadhav and Mandar P. Joshi developed a system, which converts hand gesture to voice. In this system, they are using Data glove, Flex sensor, AVR, microcontroller and Playback voice module. To get more samples they are using Arduino Microcontroller to achieve maximum range of voltage The system output is generating via speaker are presented a hand talk assisting system, which is based on the embedded system. This system provides voice to those who cannot speak. Arduino Microcontroller is using to process the data and the process data will send to android phone where it works as a voice module. This system proposed a scheme by using database driven

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which recognize hand gestures, which is totally based on skin color model and effective template matching which includes threshold approach Priiyadharshini, M., et al (2021)[3] proposed this smart gloves paper is to reduce this connection barrier. The key goal of the proposed plan is to design a cost-effective device that can give voiceto a voiceless individual with the help of Smart Gloves. This ensures that the use of smart gloves would not drive a wedge for two separate communities. This system must a dream come true for dumb and deaf people to interact normally with people without seeking other's help. In this case, this system must be needed by the disabled people. With the aid of these gloves, people with disabilities will even get a chance to develop in their respective carrier and often helps the nation.

Bhalghare, Pravin, et al (2020)[3]proposed project is to developed the cost effective system where disable people can communicate with normal people by using hand glove. This means that communication is not barrier between two communities by using smart glove. So disable can also able to grow in their respective field. Using such system by disable people can make nation grow. Key Words: Gesture Recognition, Sign Language, Flex Sensors The big reason behind this is lack of communication as deaf people are unable to listen and dumb people are unable to speak. This decreasing ratio of Literate and Employed Deaf and Dumb population is a result of the physical disability of hearing for deaf people and disability of speaking for dumb People so it yields to lack of communication between normal person and Deaf and Dumb Person.It actually becomes the same problem of two persons which knows two different languages, no one of them knows any common language so its becomes a problem to talk with each other and so they require a translator physically which may not be always convenient to arrange and this same kind of problem occurs in between the Normal Person and the Deaf person or the Normal Person and the Dumb person. Ganguly, Rohit, et al (2021)[5] proposed to help deaf and dumb people by removing communication barrier so that they are not restricted in a small social circle and are able to conveytheir feelings and emotions whenever they want. Also, it would be helpful in educational and healthissues related to deaf and dumb people. The gloves contain sensors which when touched displaysa message in the phone, thus helping the person to communicate with others. Bhat, Krishnamurthy, and C. L. Chayalakshmi (2020)[6] proposed technology for the help of differently abled people to communication effectively and in most meaningful form. The hand glove converts the hand/finger gestures in to meaningful voice messages over an Android phone. An app is designed using Android Studio for the said purpose. There are several works carried out across the globe for converting hand and finger gesture or sign language into speech. The work described in this paper uses NodeMCU as processing and wireless communication of data and it is most advanced form of all the hand glove designs so far. Sungheetha, Akey, and Rajesh Sharma (2021)[7] proposed focuses to minimize the difficulty levelbetween these two communities with smart glove devices. Besides, the author believes that result of the proposed model provides a good impact on the dump community. The smart glove contains input, control, and output module to get, process, and display the data respectively. Our proposed model is used to help these communities to interact with each other continuously without any error.The proposed model is constructed with good specification flex sensors. Little change of resistancein flex sensor is providing changes in their gesture language. So this orientation direction is calculated well and gives better results over existing methods. The wireless set can be made with Bluetooth technologies here. Here the gestures are assigned based on the alphabet letter. The sign language performs and gives audible output in the display section of the proposed model. It gives good results in our experimental setup. work focuses on good recognition rate, accuracy, and efficiency. The good recognition rate shows the continuous conversation between the two persons Hasan, Walid KA, and Nadia Naji Gabea (2019)[8] proposed aims to turn the hand gesture through electronic devices into a conversation to make communication between people with special needs and the general public in this system. A practical

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system has been developed to allow Deaf people to use a device to talk to ordinary people. The device consists of a wireless glove with flexible sensors and an accelerometer. These sensors feel the movement of the hand and fingers, then programmed by the Arduino uno microcontroller. This microcontroller will translate these movements from hand to English speech stigmatization and also there is electronic display gives text to the corresponding gestures and outputs the sound in English. The practical application of the device provides an effective means of communication for both the deaf and mute and ordinary people and reduce the gap between them where this design has been tested and it gives a good result. Sanjay, S., et al (2021) [9]proposed a Smart glove used to bridge the between the speech impairedand normal people in their day-to-day life. Nearly 70 million people are deaf by birth and 230 million people are hearing impaired or speechless because of the conditions such as autism or stroke. To overcome this situation, this system has been started, which uses flex sensors and accelerometer to read the gesture, Arduino UNO to process the input and a web UI to display the text output.Balasubramaniam, P. M., et al (2021) [10]proposed people with disabilities like deaf and dumb will find it challenging to communicate with ordinary people; there are various causes for these disabilities, we aim to overcome this issue. The proposed system consists of gloves where FLEX sensors are attached to each finger.

3. Existing Method

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 as 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. Deaf and dumb people use sign language for their communication but it was difficult to understand by the normal people. The aim of this project is to reduce the barrier between in them. The main objective of this project is to produce an algorithm for recognition of hand gestures with accuracy. In this project has a hand gloves model for gesture recognition. MEMS sensor is used to detecting the hand motions based on the stress. This project is used for the deaf and dumb people to communicate with normal people. The hand motions are detected by the MEMS sensor and the values are stored on the microcontroller memory unit. The output voices are previously stored on the voice processor unit. Depends on the hand motions the output will be displayed on the LCD and also played through the speaker. Gesture is defined as an expressive movement of body parts. The collection of data can be stored on the controller. The purpose of the segmentation algorithm is to find the terminal points of each gesture sequence. The data processing unit is used to perform the controlling and transferring function. For previous year they used image based techniques. By using this technique, we require more flexible image processing software. And another method they used cameras for an input device. By using the cameras, the captured gesture has less clarity and also it requires more power to work. The camera based techniques are more expensive To overcome the limitations of the existing system such as parallax errors, miss understanding of signs of mute people, complexity of the system, delay, reduce the man power we proposed a new system for Mute Community people.

4. Proposed Methodology

Many works were done before for solving this problem, but it became difficulty in sensing the gestures exactly. In past Electronic speaking system was designed for deaf and dumb people by using potentiometer and using micro controllers. In our project we used flex sensors which were more sensitive and hence respond quickly to minute variation in the length of the sensor. The Arduino UNO will take the instructions given by the flex sensors and process it to the voice

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module APR 9600 from which the instruction is heard from speaker. In this project flex sensors are attached to the fingers of the gloves and the deaf, dumb people when they want to convey message make signs. When they do gesture the flex sensors bend and according to the principle of the flex sensors the resistance of the sensors varies and thus hit the memory location where the message is stored from that the message is audible for us through the speaker.

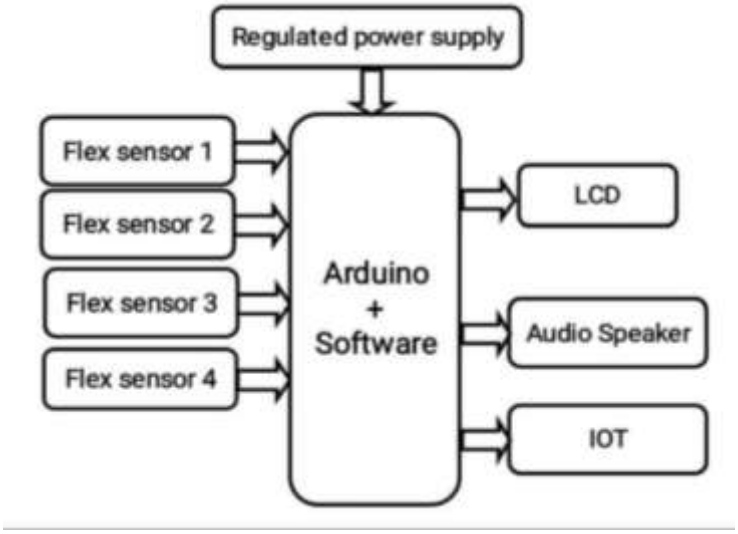

Fig. 1: Proposed block diagram of sign conversion for mute community.

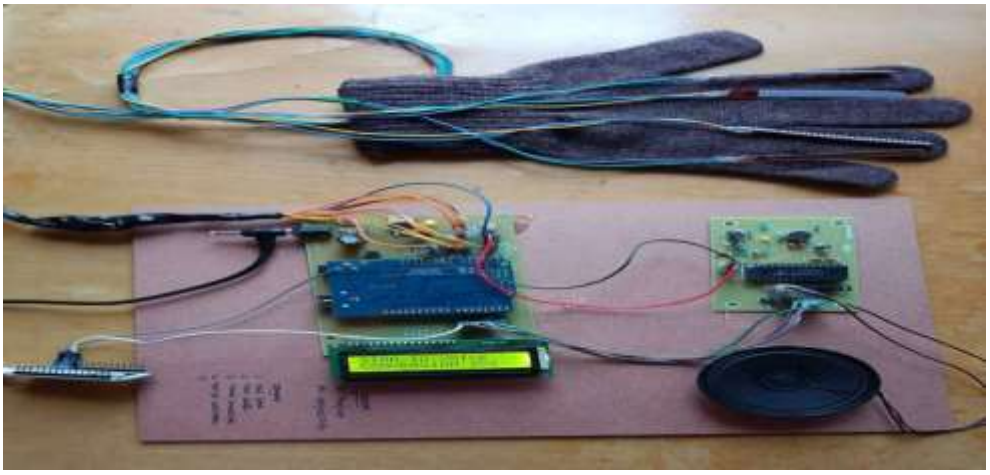

Fig. 2: Sign Conversion for Mute Community

In this system there are totally five sections:

1. Regulated power supply[RPS]
2. Input Section.
3. Output Section.
4. Arduino Microcontroller
5. APR [Automatic Play and Record] voice module.]

The RPS module converts the 230 ac volts into 5v of dc. The5v of power supply goes to all components in the system. The input of the project is Flex sensors. The flex sensors have change their resistance according to their bending and send voice through APR voice module. The IOT

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server can send the data and display the data in the IOT server app. The output has LCD, Speaker, APR voice module, IOT module also. In the Arduino microcontroller contains the software Programming code Embedded C. The main purpose of the microcontroller is the data can be control by the microcontroller. Once we should ON the kit first Reset the kit because to connect Wi-Fi to IOT server. The kit is reset the LCD displays the Medicine Remainder. After we configure to IOT server by using an TCP Telnet Terminal app. By using our mobile phone, we can connect the Wi-Fi to IOT server. Once the Wi-Fi is ON the mobile data should be OFF. By using the IP address 192.168.4.1 and port:23 connect the IOT server. Once it is connected the LCD displays the present Date and Time. In real time once we can set the commands it working on 24/7 until the power is OFF. Supposethe power is OFF we can again set the commands.

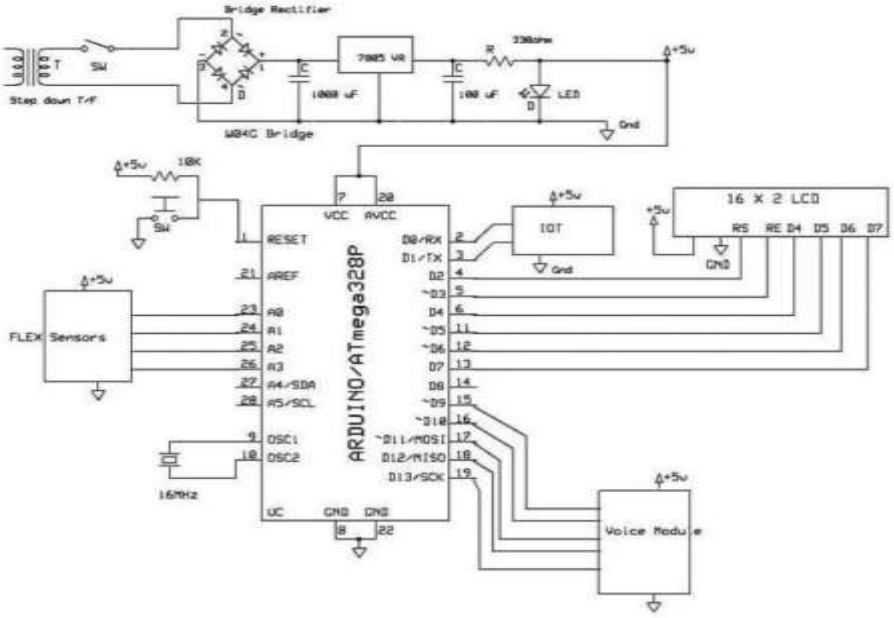

Fig. 3: Schematic Diagram

In this project we are using Atmega328p Microcontroller. It has total 28 pins. In these 28 pins we are using only 20 pins. D0-D13 are the Digital pins (14) and A0-A5 are the Analog pins (6). Here the D0, D1 are connected to the IOT, for transmitting and Receiving the data. D2-D7 pins are connected to 16*2 LCD display, D8-D13 pins are connected to APR Voice Module gives the voice of the Medicine.A4-A5 pins are connected to RTC timer which can use to counts the time. The 230v Ac is converted into 5V of DC and that is given to the circuit through pin7. Resetis given to the pin 1 which is used to Reset the circuit for connecting to the IOT module. The oscillator is connected to the pin9 and pin10, the GND is connected to the pin8 and pin22.

5. Results and Discussion

Every hand gesture made has specific values that convey a message. That message is kept in a database. In real-time, the template database is stored in the Arduino UNO and the motion sensors are fixed in their hand. For every action, the motion sensors get accelerated and gives the signal to the Arduino UNO. The Arduino UNO matches the signal received with the database and produces the speech signal. The output of the system is using the speaker. Here different signs are given andthe output is noted. Whenever a sign is made from the above given signs the microprocessor matches the sign with the stored message in the database and gives the meaning of the sign in the output in the form of text and speech. The following are some of the snapshots of different signs made and their results.

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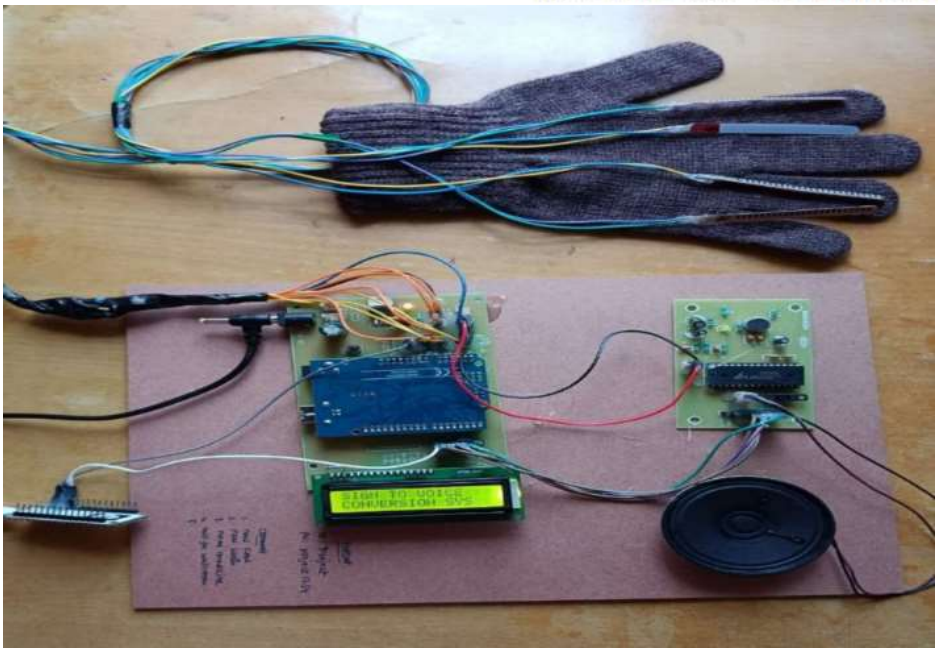

Fig. 4: Final Prototype of the Project.

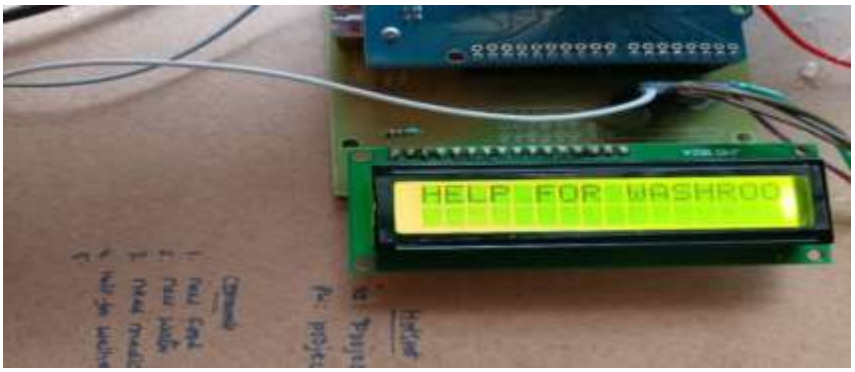

Fig. 5: Output for Help for Washroom.

Fig. 6: Output for Need Medicine.

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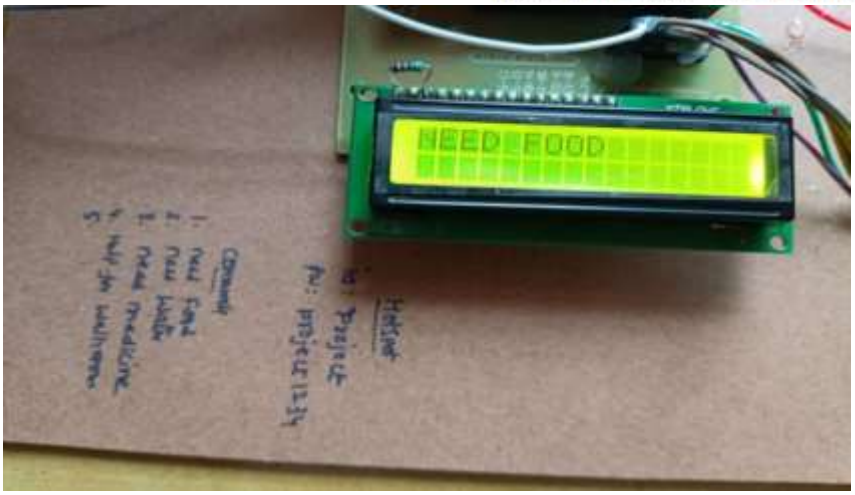

Fig. 7: Output for Need Food.

Fig. 8: Output for Need Water.

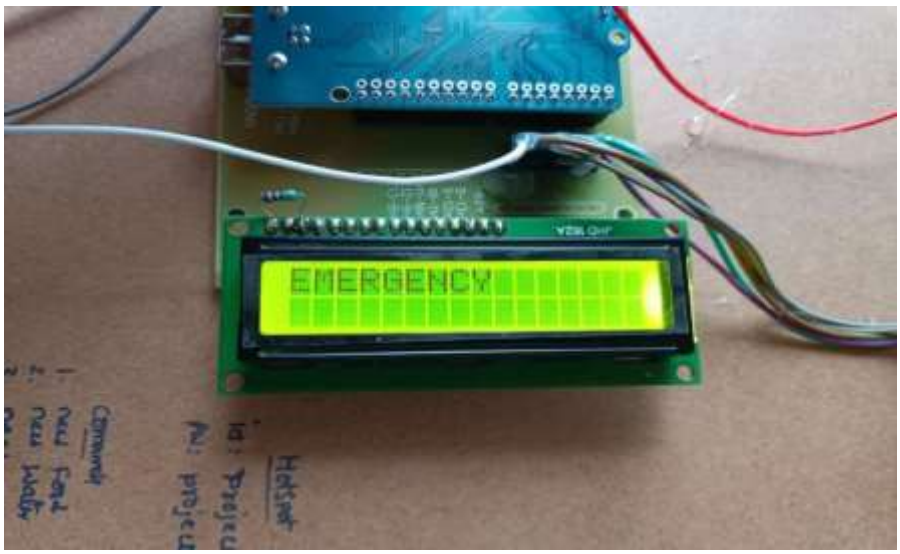

Fig. 9: Output for Emergency.

6. CONCLUSION

We were able to develop an efficient gesture recognition system that did not utilize any markers and camera, hence making it more user and cost friendly. The flex sensors in combination with the Accelerometer, A/D converter, and Arduino UNO are successfully and accurately able to translate

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ASL to text and speech. By mounting these sensors on a glove, a very convenient to use wearable is made which is not only efficient but also comfortable to use in our daily lives. It provides an efficient method of alleviating the problems of the speech-impaired community. It empowers such people with the power of speech and allows them to express themselves better. It can be concluded that the existing methods assisted in the development of our prototype, but the inclusion of new technology will surely lay a major impact in this field.

Future Scope: In the near future, more sensors can be embedded to recognize full sign language with more perfection and accuracy and most of the units can be embedded together on a single board resulting in a compact model. The system can also be designed such that it can translate words from one language to another. In the future, accuracy can be improved and more gestures can be added to implement more functions.

References

[1] Navaitthiporn, Nitipon, et al. "Intelligent glove for sign language communication." 2019 12th Biomedical Engineering International Conference (BMEiCON). IEEE, 2019.

[2] Sohelrana, Khan, et al. "A review on smart gloves to convert sign to speech for mute community." 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO). IEEE, 2020.

[3] Priiyadharshini, M., et al. "Sign speaks-an IoT based smart gloves for dumb." 2021 6th International Conference on Communication and Electronics Systems (ICCES). IEEE, 2021.

[4] Bhalghare, Pravin, et al. "Multipurpose Smart Glove for Deaf and Dumb People." International Research Journal of Engineering and Technology (IRJET) 7.04 (2020).

[5] Ganguly, Rohit, et al. "Intelligent gloves for deaf and dumb people." 2021 5th International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech). IEEE, 2021.

[6] Bhat, Krishnamurthy, and C. L. Chayalakshmi. "Advanced glove for deaf and dumb with speech and text message on android cell phone." 2020 IEEE international conference for innovation in technology (INOCON). IEEE, 2020.

[7] Sungheetha, Akey, and Rajesh Sharma. "Design of effective smart communication system for impaired people." J. Electr. Eng. Autom 2.4 (2021): 181-194.

[8] Hasan, Walid KA, and Nadia Naji Gabeal. "Implementation smart gloves for deaf and dumb disabled." International Science and Technology Journal 19 (2019): 1-20.

[9] Sanjay, S., et al. "Development of Smart Glove for Deaf-mute People." NVEO-NATURAL VOLATILES & ESSENTIAL OILS Journal| NVEO (2021): 3052-3063.

[10] Balasubramaniam, P. M., et al. "Advanced Smart Gloves for Physically Disabled Persons Using LABVIEW." Innovations in Computer Science and Engineering: Proceedings of the Ninth ICICSE, 2021. Singapore: Springer Singapore, 2022. 107-117.