Helping Hand Device for Speech Impaired People

[1]AASTHA NAGPAL
Dept. of ECE,
Women Institute of Technology
Uttarakhand Technical University, Dehradun
aasthanagpal029@gmail.com

[2]KETAKI SINGHA
Dept. of ECE,
Women Institute of Technology
Uttarakhand Technical University, Dehradun
ketakisingha111@gmail.com

[3]RAKSHITA GOURI
Dept. of ECE,
Women Institute of Technology
Uttarakhand Technical University, Dehradun
rakshitagouri12@gmail.com

[4]AQUSA NOOR
Dept. of ECE,
Women Institute of Technology
Uttarakhand Technical University, Dehradun
aqsaansari147@gmail.com

[5]ASHISH BAGWARI
Dept. of ECE,
Women Institute of Technology
Uttarakhand Technical University, Dehradun
ashishbagwari@ieee.org

[6]SHAMIMUL QAMARMA
Dept. of Computer Network and
Communication Engineering
Khalid University, Abha, Saudi Arabia
drsqamar@rediffmail.com

2020 Global Conference on Wireless and Optical Technologies (GCWOT) | 978-1-6654-1860-7/20/$31.00 ©2020 IEEE | DOI: 10.1109/GCWOT49901.2020.9391599

Abstract- **In this paper, we propose a well-organized system to bridge the gap of communication for the speech-impaired person and assist him in a smooth conversation with a normal person by providing an artificial mouth. This paper includes the method of easy conversion of the hand gestures and the intact conversion of these gestures into speech and text messages. A flex sensor is used to take the input from gestures and forward it to the microcontroller Arduino Uno where a template database is created to assign the desired message which is further processed to be displayed on the LCD display and the acquainted sound signal stored in the Secure Digital card is amplified before it is provided to the speaker to generate the audio signal and ensure better sound quality.**

Keywords- Microcontroller, Sensors, Speech, Hand Gestures, LCD Diusplayr.

I. INTRODUCTION

Generally, sign language is not easily understood by normal people as it provides signs for some words and cannot express sentences. People have to make guess for sign used and can interpret it wrong. It becomes difficult to communicate as there is no common language of communication and we always need a translator to establish communication between a normal person and deaf or dumb.

To overcome this problem, we have designed a system that is portable and light in weight. This system consists of two sections: transmitter and receiver. In transmitter section, a hand glove is embedded with flex sensors and Arduino microcontroller interfaced with Bluetooth module which gives change in resistance values of gestures as input to the receiver. In receiver section, the Arduino Uno board finds the corresponding action of the gesture. An SD card is used for storing voice data. The LCD display and speaker provides the message from deaf and dumb people by displaying text and playing audio respectively. By making a simple hand gesture, the person is able to convey his message. In this way, a speech-impaired person can speak what he wants with the normal person.

The paper has been categorized as: Section II presents related work. Section III presents the system description. Finally, Section IV concludes the paper.

II. RELATED WORK

In the year 2014, the systems developed converted the gestures into audio and text using a PIC controller but the limitation of this system was that it converted the gestures to audio alphabetically instead of words and accuracy of the words spoken using allophones was less [1]. In 2016, the system used the sensor for the input but the conversion of gesture to audio was through a computer, this again created the problem of portability with another system [2]. In the year 2017, the gestures were converted to speech using a flex sensor and an android application was used to convert the speech to text [3], but the made glove was bulky. Another approach used the method of image sensing in the same year. A hand glove was developed using pointers on it which helped in defining the shape of the alphabet. [4], but this method focuses on the conversion of gestures to only speech message not text message. The method introduced in the year 2018 used the microcontroller-based technique with flex sensor and sound and recorder playback for audio signal [5], but the voice quality using this system was very low and it was limited to only a few recordings. Further, the system was developed in the same year using the image processing technique but again generated the output alphabetically [6]. In the year 2019, [7] proposed an accelerometer gyroscope sensors based model that was used to recognize the gestures and conversion was done with the help of python language but this system had less accuracy rate.

Sponsored by TEQIP-III, NPIU, MHRD, Govt. of India and World Bank Project.

III. SYSTEM DESCRIPTION

The system consists of two modules i.e. Transmitter and Receiver.

A. Module 1- Transmitter

The flowchart of the transmitter section of the device or module is shown in the figure 1. In the transmitter section, input from flex sensors is taken as a, b, c, d. The specified range is defined for each message. In loop condition, if the input value is in range, then its output will be transmitted otherwise it will not be transmitted.

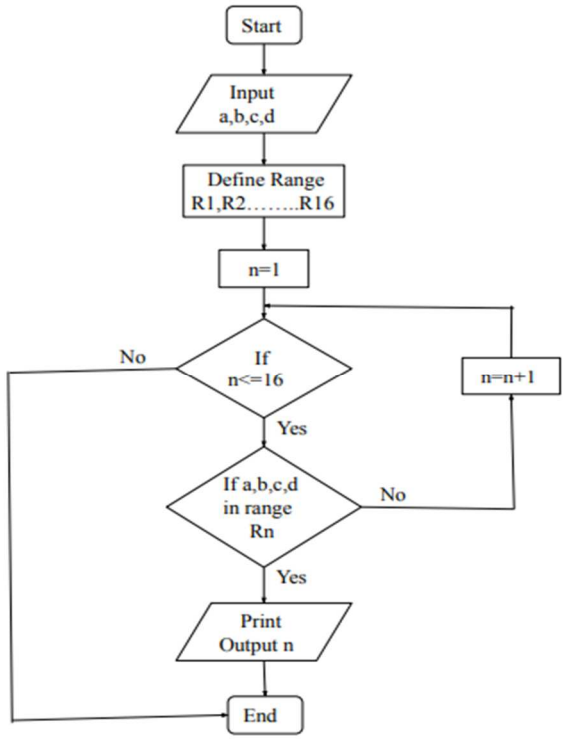

Fig.. 1. Flowchart of the transmitter section

B. Module 2 – Receiver

Figure 2 shows the flowchart of the receiver section of the device. Different text messages are preloaded in Arduino and audio messages in the SD card. In loop condition, if the received value matches the preloaded value then its corresponding message will be displayed and it will check the voice message in the SD card and will play the audio. If the received value doesn't matches with the preloaded value then "try again" will be displayed.

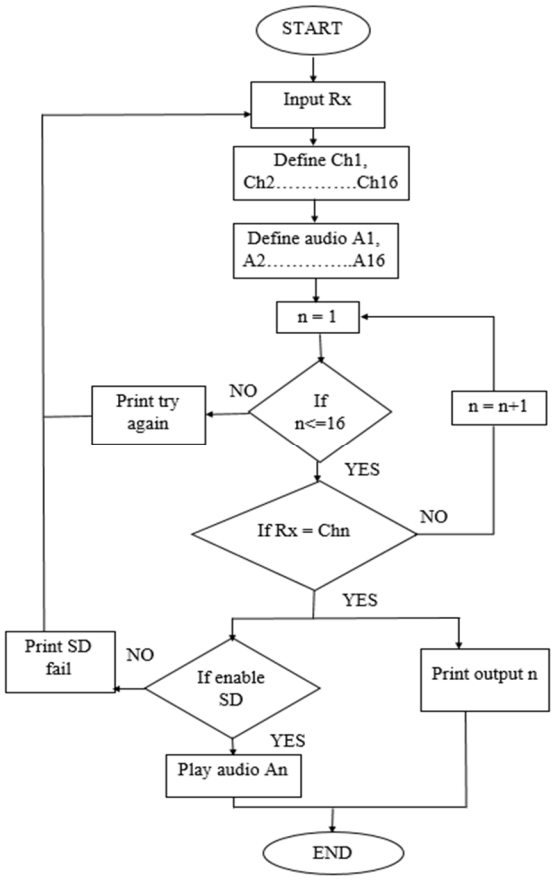

Fig. 2. Flowchart of the receiver section

C. Software Simulation

Proteus software is used for performing the simulation and arduino is used for writing the program. The pre-loaded program in Arduino takes the combination of resistance values as input and compares it with the already saved values as shown in table I [8]. LCD display shows the desired text message according to values of resistance. The LCD display is connected in digital pins 7 to 12 of the Arduino board.

Table I. Different combinations with a message to be displayed

Values of resistors				Message to be displayed
R1	R2	R3	R4	
0	0	0	0	How you doing?
0	0	0	1	I am feeling good.
0	0	1	0	Can you give me a glass of water?
0	0	1	1	Thank you for your help.

Sponsored by TEQIP-III, NPIU, MHRD, Govt. of India and World Bank Project.
978-0-7381-2510-7/20/$31.00 ©2020 IEEE

0	1	0	0	I am feeling hungry.
0	1	0	1	Let's go on a walk.
0	1	1	0	Would you like to accompany me?
0	1	1	1	Good Morning. Have a nice day.
1	0	0	0	I want pizza
1	0	0	1	Let's play a game.
1	0	1	0	It's time for my medicine.
1	0	1	1	Can you take me to washroom?
1	1	0	0	Please have a seat.
1	1	0	1	What would you like to eat?
1	1	1	0	Switch off the lights.
1	1	1	1	Goodbye.

If the received value matches the stored value, then the message corresponding to it is displayed otherwise 'Try Again'' is displayed on the LCD screen.

D. Results

1. Accuracy from hardware implementation

We have calculated the accuracy of different messages from hand gesture recognition. We have performed 50 iterations and determined how accurately the message is being displayed. Figure 3 shows the bar graph of accuracy of different messages. The x-axis depicts accuracy and y-axis depicts the code number of the message.

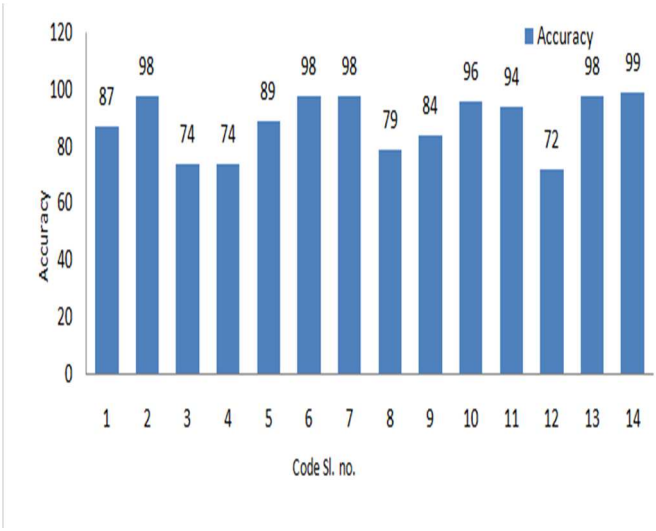

Fig. 3. Bar graph of accuracy of different messages

Table II shows the accuracy of different messages with their gesture code. The accuracy of the system is 92.725%.

Table II. Accuracy of different messages

Sl. No.	Gesture code	Accuracy
1	0010	87
2	0011	98
3	0100	74
4	0101	74
5	0110	89
6	0111	98
7	1000	98
8	1001	79
9	1010	84
10	1011	96
11	1100	94
12	1101	72
13	1110	98
14	1111	99
Total		92.7252747

On comparing this accuracy with other research work, it is slightly higher than others for 50 iterations [7].

IV. Conclusion and Future Work

The proposed model is well-structured equipment that helps to reduce some of the difficulties faced by verbally challenged people. The system is light weighted and easily portable. There is no use of expensive technology which makes it cost effective. The proposed system reduces the problem of bulkiness and has high accuracy. It has a large database to store many sound signals with enhanced sound quality at the output. With just one simple gesture this prototype provides a sentence for it, reducing the physical efforts by the speech-impaired person. This system can be adjusted according to the need of user. This makes the system comfortable to be used in day to day life.

Acknowledgment

The authors deeply convey thanks of gratitude to their parents for their encouragement and erect support, if not for their blessings and grace of God this paper would not be possible in the given time frame.

Sponsored by TEQIP-III, NPIU, MHRD, Govt. of India and World Bank Project.

978-0-7381-2510-7/20/$31.00 ©2020 IEEE

REFERENCES

[1] V.Padmanabhan, M.Sornalatha, "Hand gesture recognition and voice conversion system for dumb people", Published in International Journal of Scientific & Engineering Research, vol. 5, no. 5, pp. 427-431, may 2014.

[2] P A S Ram kumar , N S N Lakshmipathi Raju ,T Saran kumar, V Venkateswarulu, "Hand Gesture Recognition Using Sign Language Transcription System", International Journal of Engineering Science and Computing, vol. 6, no. 10, pp. 2520-2523 , october 2016.

[3] Mandar Tawde , Hariom Singh , Shoeb Shaikh, "Glove for Gesture Recognition using Flex Sensor", Published in International Journal of Recent Trends in Engineering & Research (IJRTER), vol. 03, no. 03, pp. 35-39, march 2017.

[4] K. Manikandan, Ayush Patidar, Pallav Walia, Aneek Barman Roy , "Hand Gesture Detection and Conversion to Speech and Text", International Journal of Pure and Applied Mathematics, vol. 120, no.6, pp. 1347-1352, 2018.

[5] Komal Vede, Priyanka Vanjare, Pradnya Gaikwad, "Sign to Speech Converter Gloves for Deaf and Dumb People", Published in International Journal of Innovative Research in Computer and Communication Engineering ,vol. 6, no. 4, pp. 3719-3724, april 2018.

[6] T.Yamunarani , G.Kanimozhi, "Hand Gesture Recognition System for Disabled People using Arduino", International Journal of Advance Research and Innovative Ideas in Education (IJARIIE), vol. 4, no. 2, pp. 3894-3900, 2018.

[7] Vaibhav Mehra, Aakash Choudhury, Rishu Ranjan Choubey, "Gesture To Speech Conversion using Flex sensors, MPU6050 and Python", Published in International Journal of Engineering and Advanced Technology (IJEAT), vol. 8, no. 6, pp. 4686-4690, august 2019.

[8] Aastha Nagpal, Ketaki Singha, Rakshita Gouri, Aqusa Noor, Ashish Bagwari,Hand Sign Translation to Audio Message and Text Message: A Device," 2020 12th International Conference on Computational Intelligence and Communication Networks (CICN), Bhimtal, India, 2020, pp. 243-245, doi: 10.1109/CICN49253.2020.9242549.

Sponsored by TEQIP-III, NPIU, MHRD, Govt. of India and World Bank Project.

978-0-7381-2510-7/20/$31.00 ©2020 IEEE