International Conference on Recent Trends in Data Science and its Applications
DOI: rp-9788770040723.032

Talking Glove Using DF Mini Player and Speaker

Soundariya K
Department of ECE
Rajalakshmi Engineering College
Chennai, India
200801199@rajalakshmi.edu.in

ShanmugaPriya P
Department of ECE
Rajalakshmi Engineering College
Chennai, India
Shanmugapriya.p@rajalakshmi.edu.in

Sumayyah S
Department of ECE
Rajalakshmi Engineering College
Chennai, India
200801218@rajalakshmi.edu.in

Sreenidhi P
Department of ECE
Rajalakshmi Engineering College Chennai, India
200801204@rajalakshmi.edu.in

Sowmiyasri A
Department of ECE
Rajalakshmi Engineering College Chennai, India
200801201@rajalakshmi.edu.in

***Abstract* — This paper presents the design of Talking Gloves which converts Sign Language to Speech. The project's main aim is to develop an affordable communication aid which can help the speech and hearing impaired people to express their thoughts and opinions without any difficulties, thus bridges the gap between two different groups. Specially challenged person can also uplift their career with the help of Talking Gloves. When speech and hearing impaired people wear that glove, they can communicate through sign language easily just by bending their fingers. The respective output is heard from the speakers using the DF mini player which reads the SD card and selects the sample voices stored in it and the corresponding text is also displayed using the LCD with I2C module.**

Keywords —Arduino UNO, LCD with I2C module, DF-mini player, speaker, Resistors.

I. INTRODUCTION

People with hearing and speech impairment had difficulties in communicating in the society till now while others do not understand this sign language as it involves the orientation and movement of hands, arms/body, combining of various hand shapes and various facial expressions to express the thoughts. A new communicational aid is developed which converts the hand gestures into speech output which enables deaf and dumb individuals to interact verbally with the other people and share their thoughts and opinions.

The device of communication is a "The Talking Glove". The glove is fitted with the flex sensor whichmeasures the change in resistance based on the degree of bend it is subjected to. The values of the flex sensors is compared with the data alreadystored and the respective speech is heard using Speakers as played by the DF mini Player.

II. LITERATURE SURVEY

The work related to Sign language conversion using Arduino Mega, Bluetooth, flex sensor, ARM controller is described in this section.

SanishManandhara et al [1] The Hand Gesture Vocalization was proposed by him for Speech and Hearing impaired people. This system includes Arduino Mega, Accelerometer and Flex sensors, which is used to translate the given hand gesture into its proper form of text, audio, and graphical representation, which is easily understood by any other common person. In the current system, the training model predicts the accurate output with a percentile of 85 which makes of the Random forest algorithm.

Mangesh T Nikam et al [2] put forward a system consisting of 3 axes accelerometer sensor being mounted on hands. The system for Deaf and Dumb People is named as Talking Hands. The micro- controller senses the movements using the accelerometer with the help of ADC. Each movement is set with a specific word and this movement is read by the micro-controller and makes the Voice IC to play that particular pre-recorded message.

KshirasagarSnehal P et al [3] proposed gesture vocalizer for deaf and dumb. The proposed systemuses AVR microcontroller (ATmega16), flex sensor, accelerometer, speech synthesizer, speaker, and LCD.Flex sensor detects the degree of bend and its output along with the output of the accelerometer are converted to the digital values where they are compared with the prerecorded values and the corresponding audio is played via speaker and the text message is displayed using LCD.

SupriyaShevate et al [4] proposed a Vocalizer based on Gestures for Hearing and speech impaired people. This vocalizer detects all the hand movements and converts it into an audio and displayed on the LCD screen. For all speech synthesizer and sensors ARM 7 controller is used. Two types of accelerometer and flexible sensors as a titled sensor are present in data glove.

Mali PoojaDadaram et al [5] proposed a system using gloves with Flex Sensors and Arduino to convert Sign Language to Speech. This method uses a flex sensor and microcontroller such as Arduino UNO attached to glove, while the data is transferred, the LED will light up. With respect to each touch a change in resistance which is uniform is made by the rotation detector and the hand gestures are analysed. This process is completed in controller. The values are compared according to the touch in the website, and audio and text are generated as output.

Khan, Mubashir et al [6] proposed "SignTalk and animator for speech and hearing impaired." This system uses flex sensor, Arduino Nano, accelerometer, gyroscope and bluetooth where the hand gestures are converted to digital values using ADC.These values are sent to mobile phones through Bluetooth and the respective audio is played.

Boppana, Lakshmi et al [7] has put forward a system for Deaf and Dumb, an Assistive Sign Language Converter. This device enables a person to interact with other people where controller processes images, compared with samples using processing techniques and identifies signals with in-

DOI: rp-9788770040723.032

depth reading models. The text-to-speech module converts these features to real-time speech.

Rajaganapathy S, Aravind B, Keerthana B, Sivagami M [8] “Conversion of Sign Language to Speech with Human Gestures”. This system uses Microsoft Kinect to track the human joints and gestures. The stream of input data is the live actions of human skeleton. The System keeps tracking with the user defined gestures if both the gestures are matched the corresponding word is played.

Aishwarya V, NarenRaju N, Singh S Johanan Joy, T NagarajanVijayalakshmi P [9] “Hidden MarkovModel-Based Sign Language to Speech Conversion System in Tamil.” This work constitutes the use of accelerometer, gyroscope sensor-based hand gesture that recognises various signs and converts into corresponding Tamil phrases.

Harini R, Janani R, Keerthana S, MadhubalaS,Venkatasubramanian S [10] “Sign Language Translation”. This system consists of image capturing cum processing, feature extraction and conversion by using OpenCV python library. The prediction can be done with atmost accuracy and it also uses convolution neural network.

ParamaSridevi, Tahmida Islam, UrmiDebnath, Noor A Nazia, RajatChakraborty, Celia Shahnaz. [11] “Sign Language Recognition for Speech and Hearing Impaired by Image Processing in MATLAB”.The proposed system converts the sign language to speech using MATLAB where it extracts the features of the hand gestures and it is compared with the already stored features in the database and produces the output depending on the highest resemblance.

YashJhunjhunwala, Pooja Shah, PradnyaPatil [12] has put forward a direct algorithm which converts the basic Alphabets and numeric which will be further extended for recognition of words.The glove uses flex sensor which monitors the amount of bend which in turn relates the change in resistance.

III. Existing System

In the existing system, the glove translates the American Sign Language alphabets to speech using Arduino Nano. The glove uses flex sensors, accelerometer and HC-05 bluetooth module to connect the glove to the mobile phone. This system is not efficient enough to help the speech and hearing impaired people to communicate with others.

IV. Proposed System

The proposed method involves the use of flex sensor in the place of image processing technique. Initially, the hand gestures are converted to analog signal, then it is converted to digital signal with the help of ADC from the Microcontroller. The digital signal is processed in the Arduino and the corresponding is heard output.

The Figure 4.1 and 4.2 decribes the block diagram and work flow of the proposed system.

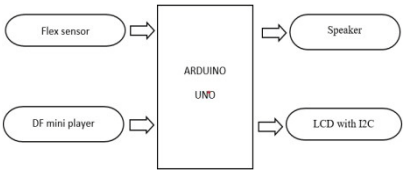

Fig. 4.1. Block diagram

Fig. 4.2. Work flow

V. Working Principle

Initially a power supply of +5V is given to the circuit as an input. Arduino Uno acts as a microcontroller and the code is executed using the software Arduino IDE. The Flex Sensors detects the change in the resistance based on the degree of bend it is subjected to. The output of these flex sensors are analog in nature which are sent to the Arduino where analog signals are converted to digital and this digital information is compared with the already stored data in Arduino. If the output from the flex sensors are matched with the stored data i.e., the string or alphabets, then the respective output is heard from the speakers using the DF mini player which reads the SD card and selects the sample voices stored in it.It also displays the output speech to text using the LCD16X2 with I2C module.

VI. Results and Discussions

The proposed scheme provides a interpersonal communication between the two groups easily by converting the hand gestures into speech. The additional feature of this system is to display the output speech into text using the LCD with I2C module. So, this project is quite feasible and easy to operate which breaks the gap

DOI: rp-9788770040723.032

between both the communities. For convenience few actions are translated and the output is shown.

The Figure 6.1. Signifies the hardware connection that is required for converting sign language to speech.

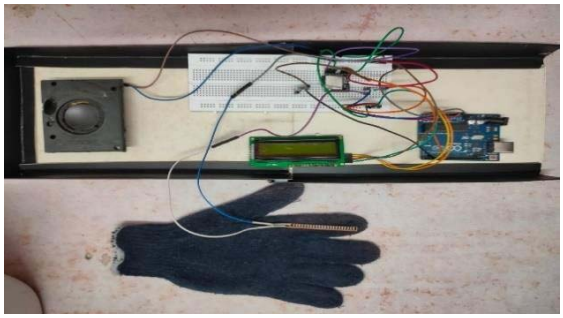

Fig. 6.1. Hardware setup for implementing Talking Glove

The Figures from 6.2. to 6.7. shows the working of the proposed system which consist of**:** Arduino UNO, LCD with I2C module, DF-mini Player, Speaker, Resistors.

Fig. 6.2. Initializing of Sign Language to Speech conversion.

Fig. 6.3. Initializing of DF-mini Player

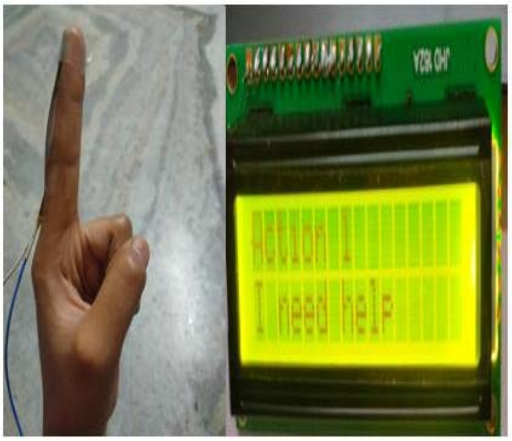

Fig. 6.4. The display of action 1 representing the statement “I need help”.

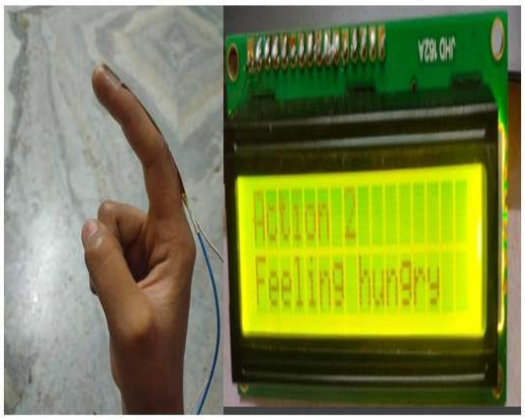

Fig. 6.5. The displaying of action 2 represents the statement “Feeling Hungry”.

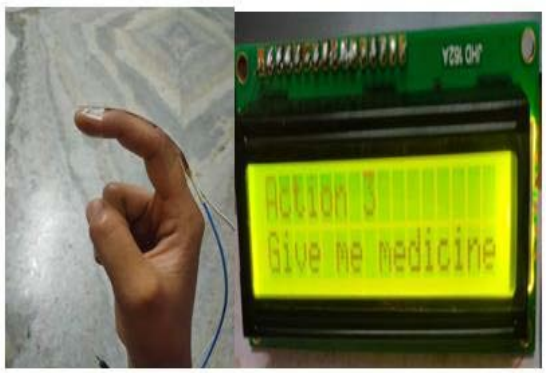

Fig.6.6.Thedisplayingoftheaction3representsthestatement“Givememedicine”.

DOI: rp-9788770040723.032

Fig. 6.7. The display of action 4 representing the statement “I want to sleep”.

The Figure 6.8 and 6.9 depicts the graphical representation between the change in the resistance versus the degree of bend of the flex sensor and the time response of the flex sensor to change the sign language to speech with respect to voltage.

Fig.6.8. Relationship between the variation of resistance and degree of bend.

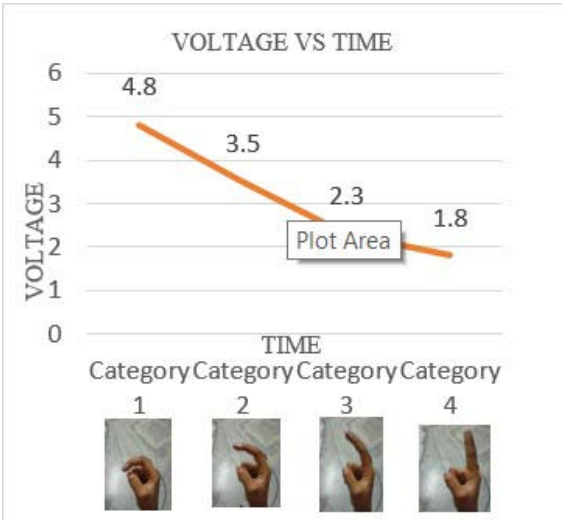

Fig.6.9. The time response of the flex sensor to change the sign language to speech.

VIICONCLUSION

In this project, we developed a system using a glove which provides an opportunity for the speech and hearing impaired people to communicate with others easily. The use of flex sensors, DF mini Player, Speaker, Resistors onto a glove helps to reduce the gap between the two different groups of people. This device will suit better for all the people with various oral disabilities. This project can be further enhanced by integrating with various services which helps to increase the employment for the deaf and dumb people .This can be paired up with fitness sensor to monitor health of the individual. Further, they can be geared up with the controller to provide home automation on finger tips.

REFERENCES

[1] D. J. Sturman and D. Zeltzer, “A survey of glove-based input,” IEEE Comput. Graph. Appl., vol. 14, no. 1, pp. 30–39, Jan. 1994.

[2] T. Takahashi and F. Kishino, “Hand gesture coding based on experiments using a hand gesture interface device,” SIGCHI Bull., vol. 23, no. 2, pp. 67–74, Apr. 1991.

[3] J. L. Hernandez-Rebollar, R. W. Lindeman, andN. Kyriakopoulos, “A multi-class pattern recognition system for practical finger spelling translation,” in Proc. IEEE Int. Conf. Multimodal Interfaces, 2002, pp. 185– 190.

[4] W. Kadous, “GRASP: Recognition of Australian sign language using instrumented gloves,” Bachelor’s thesis, Univ. New South Wales, Sydney, Australia, 1995.

[5] P. Vamplew, “Recognition of sign language gestures using neural networks,” presented at the Eur. Conf. Disabilities, Virtual Reality Associated Technol., Maiden.

[6] W. Gao, J. Ma, J. Wu, and C. Wang, “Sign language recognition based on HMM/ANN/DP,” Int.J. Pattern Recognit. Artificial Intelligence, vol. 14, no. 5, pp. 587–602, 2000.

[7] R. H. Liang and M. Ouhyoung, “A real-time continuous alphabetic sign language to speech conversion VR system,” Compute. Graph. Forum, vol. 14, no. 3, pp. 67–76, 1995.

[8] J. S. Kim, W. Jang, and Z. Bien, “A dynamic gesture recognition system for the Korean sign language (KSL),” IEEE Trans. Syst., Man, Cybern. B, Cybern., vol. 26, no. 2, pp. 354– 359, Apr. 1996.

[9] DrAnupama H S, DrUsha B A, SpoorthyMadhushankar, VarshaVivek, YashasswiniKulkarni, “Automated Sign Language Interpreter Using Data Gloves,” IEEE Int. Conf. on Artificial Intelligence and Smart Systems, 2021.

[10] Pazhani. A, A. J., Gunasekaran, P., Shanmuganathan, V., Lim, S., Madasamy, K., Manoharan, R., &Verma, A. (2022). Peer–Peer Communication Using Novel Slice Handover Algorithm for 5G Wireless Networks. Journal of Sensor and Actuator Networks, 11(4), 82.

[11] NitiponNavaitthiporn, PreeyaratRithcharung, PhitnareeHattapath, C.Pintavirooj,” Intelligent glove for sign language communication,” 12th Biomedical Engineering Int. Conf. (BMEiCON), PP. 19-22 Nov.2019.

[12] AlKhuraym, BatoolYahya et al., “Arabic Sign Language Recognition using Lightweight CNN- based Architecture,” Int. Journal of Advanced Computer Science and Applications, 2022.

[13] Saleh, Yaser and Ghassan F. Issa. , “Arabic Sign Language Recognition through Deep Neural Networks Fine-Tuning,” Int. J. Online Biomed. Eng. , 16 (2020): 71-83

[14] Lee, C. K. M. et al., “American sign language recognition and training method with recurrent neural network,” Expert Syst. Appl. 167, 2021.

[15] X. Han, F. Lu and G. Tian, “Sign Language Recognition Based on Lightweight 3D MobileNet-v2 and Knowledge Distillation,” ICETIS 2022, 7th Int.Conf. on Electronic Technol. and Information Science, 2022.

DOI: rp-9788770040723.032
[16] Dhanabalan, S. S., Sitharthan, R., Madurakavi, K., Thirumurugan, A., Rajesh, M., Avaninathan, S. R., & Carrasco, M. F. (2022). Flexible compact system for wearable health monitoring applications. Computers and Electrical Engineering, 102, 108130.

[17] Prof. ChhayaNarvekar, SayuktaMungekar, ArpitaPandey, MansiMahadik, “Sign Language to Speech Conversion using Image Processing and Machine Learning,” Int. Journal For Technological Research In Engineering Volume 7, Issue 12, August-2020.

[18] Bharath A Manoj,” Conversion of Sign Language to text and Speech and Prediction of Gesture,” Int. Journal of Recent Technology and Engineering (IJRTE), March.2020