International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 07 | July - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Sign Language Converter Using Hand Gloves for Patient

BHAGYASHRI SANJAY DHONGDE[1], Dr. S. J. Nandedkar[2]

[1] Department of Electronics and Tele-Communication Engineering Maharashtra Institute of Technology, Aurangabad-431028

[2] Departments of Electronics and Tele-Communication Engineering Maharashtra Institute of Technology, Aurangabad-431028

Abstract - This paper describes the design of Talking Gloves, which transform Sign Language to Speech. The project's major goal is to provide a cheap communication aid that can assist speech and hearing challenged individuals in expressing themselves effectively bridges the gap between two groups. Talking Gloves can assist individuals with special needs advance in their careers.

Wearing the glove allows speech and hearing challenged individuals to readily communicate using sign language by just bending their fingers. The DF small player scans the SD card and picks sample sounds to play over the speakers, while the LCD with I2C module displays the relevant text. Global speech-impaired persons frequently use nonverbal communication, such as hand gestures. The issue lies in successfully comprehending and translating these movements. This is especially important in eldercare and the medical field, where communication barriers are prevalent. India's speech-impaired population has additional challenges owing to the complexity of sign language. A solution is necessary to facilitate smooth interactions and close the communication gap. Sign language, which is essential for the hearing challenged, can be difficult to communicate with others who are unfamiliar with it. Technology can turn sign language movements into audible words, aiding the speech-impaired and showing possibilities in eldercare and medical settings. This research presents a groundbreaking sign language-to-speech conversion method.

Key Words: Flex sensor, Sign language, Arduino Nano, DFmini player, Smart glove.

1. INTRODUCTION

People with hearing and speech impairments struggle to communicate in society, and others may not understand sign language, which involves blending hand shapes and facial expressions to express ideas. A novel communication device translates hand motions into words, allowing deaf and dumb individuals to engage vocally and express their thoughts and opinions.
The communication gadget is called "The Talking Glove." The glove has a flex sensor that detects resistance changes dependent on bent. The flex sensor measurements are compared to previously recorded data.

Fig -1: Static Gestures

2. LITERATURE SURVEY

The project involves converting sign language using Arduino Nano, Bluetooth, flex sensor, and an ARM controller.

This section explains what happens. Sanish Manandhara et al. [1] He proposed hand gesture vocalization for those with speech and hearing impairments. This system uses Arduino Mega, Accelerometer, and Flex sensors to transform hand gestures into text, audio, and graphical representations that everyone can understand. The present system's training model uses the Random Forest technique to predict correct output with a percentile of 85.

Mangesh T Nikam et al [2] proposed a device with three-axis accelerometer sensors positioned on hands. Talking Hands is a technology designed for Deaf and Dumb individuals. The microcontroller detects motions using an accelerometer and ADC. The microcontroller reads each movement and triggers the Voice IC to play a pre-recorded message based on the word.

Kshirasagar Snehal P et al [3] presented a gesture-based vocalize for the deaf and dumb. The suggested system incorporates an AVR microcontroller (ATmega16), flex sensor, accelerometer, voice synthesizer, speaker, and LCD. The flex sensor and accelerometer outputs are converted to digital values and compared to pre-recorded values. Audio is played via speaker and text message is shown on the LCD.

Supriya Shevate et al [4] presented a gesture-based vocalize for those with hearing and speech impairments. The vocalize recognizes hand gestures and turns them into audio, which is

shown on the LCD panel. All voice synthesisers and sensors use an ARM 7 controller. Data gloves have two types of sensors: accelerometers and flexible sensors.

Mali Pooja Dadaram et al. [5] created a system that uses gloves, Flex Sensors, and Arduino to transform sign language to speech. This approach involves attaching a flex sensor and microcontroller, such as an Arduino UNO, to a glove. As data is sent, the LED lights up. The rotation detector generates consistent resistance changes for each contact and analyses hand motions. This operation is conducted in the controller. The website compares values based on touch, and outputs music and text.

Khan, Mubashir et al [6] developed "SignTalk and Animator for Speech and Hearing Impaired." This system utilizes a flex sensor; Arduino Nano, accelerometer, gyroscope, and Bluetooth to translate hand motions into digital values using ADC.Bluetooth-enabled mobile phones get these values and play the corresponding audio.

3. Body of Paper

The glove now uses Arduino Nano to convert American Sign Language alphabets into voice. The glove connects to mobile Arduino nano using flex sensors. The current system does not effectively assist those with speech and hearing impairments in communicating with others.

The suggested solution uses flex sensors instead of image processing techniques. Hand motions are first transformed to analogue signals, which are subsequently translated to digital signals using the Microcontroller's ADC. The Arduino processes the digital signal and produces the relevant output. Figures 4.1 and 4.2 show the block diagram and workflow of the proposed system.

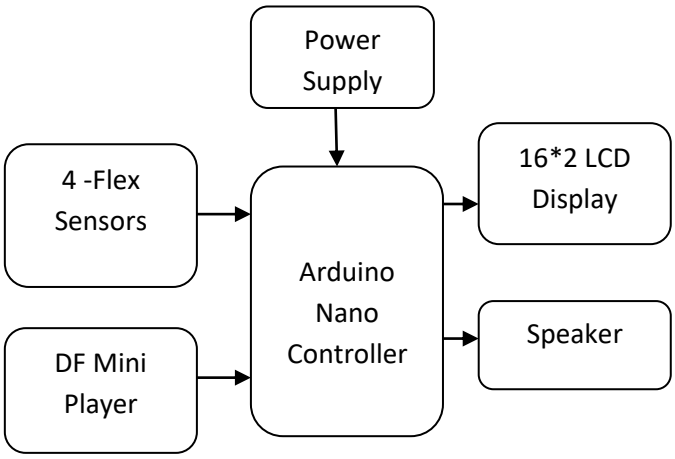

Fig -2: Block Diagram for Smart Glove

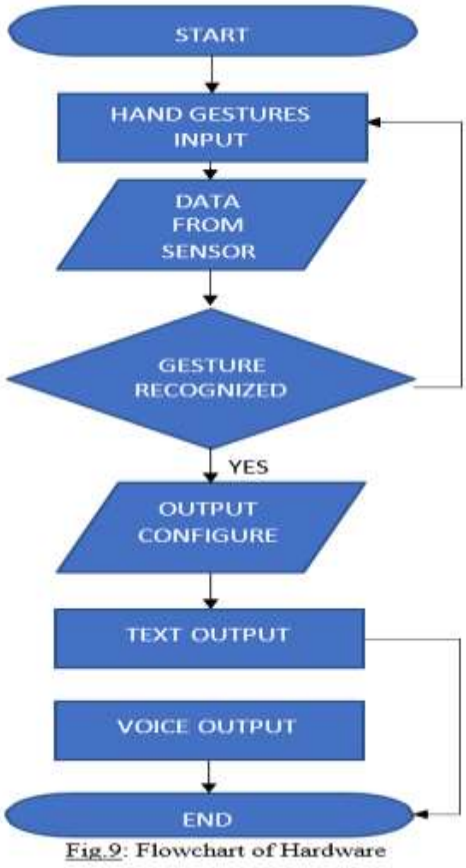

Fig -3: Work flow

4. WORKING PRINCIPLE

Initially, the circuit receives a +5V power source as input. Arduino Nano is a microcontroller that executes code using the Arduino IDE software. The Flex Sensor senses resistance changes dependent on bent. Flex sensors generate analogue signals, which are translated to digital and compared to previously recorded data on the Arduino. When the flex sensors' output matches the recorded data, such as strings or alphabets, the DF small player scans the SD card and picks sample sounds to play over speakers. The LCD16X2 with I2C module shows speech-to-text output.

5. RESULTS AND DISCUSSIONS

The suggested technique facilitates communication between each other by transforming hand motions to voice. This system includes an LCD and I2C module for display speech output as text. This concept is realistic and simple to implement, bridging the gap between both populations. A limited number of activities are translated and shown for accessibility. Figure 4 shows the hardware connection necessary for transforming sign language to voice.

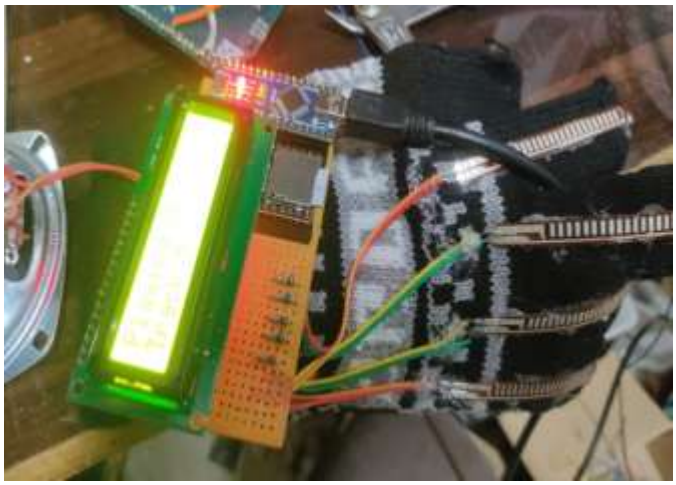

Fig -4: Design of the smart glove

Fig -5: The display of action 1 representing the statement "I Need Water"

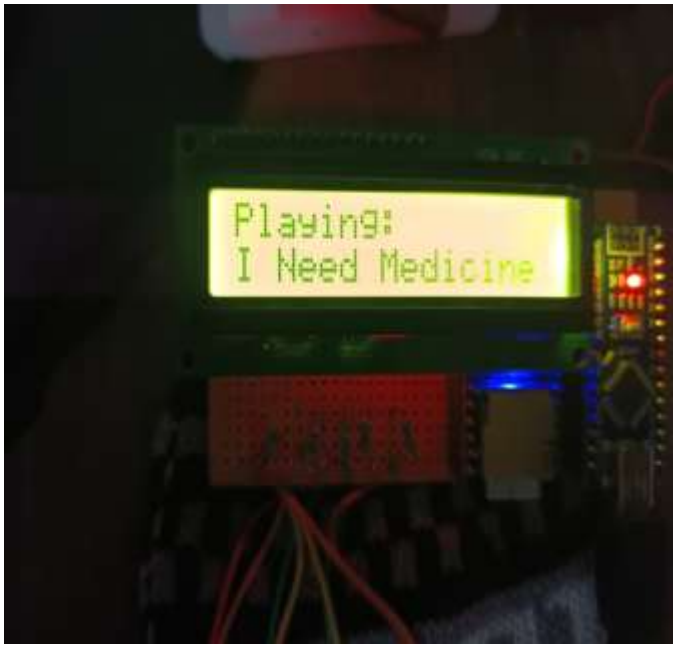

Fig -6: The displaying of action 2 represents the statement "I Need Medicine".

Fig -7: The displaying of action 3 represents the statement "I Need Food".

Fig -8: The displaying of action 4 represents the statement "I'm Not Feeling Well".

6. CONCLUSIONS

We created a glove-based solution to help speech and hearing challenged individuals communicate more effectively. Adding flex sensors, DF mini player, speaker, and resistors to gloves can bridge the gap between diverse groups of people. This gadget is suitable for those with various oral impairments. This idea may be strengthened by combining with other agencies to increase employment opportunities for deaf and dumb individuals. This may be linked with a fitness sensor to track an individual's health. Additionally, they may be connected to a controller, allowing for easy home automation.

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.