

To begin with, we monitored patients' bending hands using two integrated flex sensors on the smart hand gloves. When bent, flex sensors' resistance values vary. The resistance from the sensor's data was transformed into voltage using the voltage divider device. In order to compare the sensed data to the microcontroller's default database, the microcontroller analyzes the data and transmits it to a computer. The flex sensor voltages must fall within particular ranges, as mentioned in the table below, in order to produce an alphabet (for a test example, we utilized alphabets from A to E). We have undertaken a number of test scenarios across a variety of categories in order to achieve the desired output from the sensors.

4.2 Test Case 1

To show the alphabet on the serial monitor on the Arduino IDE platform, we will employ both the flex sensors, referred to as flex sensor 1 and flex sensor 2. When we attempt to bend the rest flex sensor into a different position, resistance fluctuates. When flex sensors 1 and 2 are sufficiently bent, a voltage output will be created. The voltage levels of flex sensors depend on how they are bent. The first and second flex sensor voltages are 0.74 and 1.23 volts, respectively.

At those voltage levels, the serial monitor will show the matching letter, as seen in the picture. The final image is displayed below as a result, and this change in resistance is translated to voltage using the voltage divider rule. This voltage value of 1.18 volts therefore dictates how the letter B is displayed on the serial monitor. The result is displayed in the image below.

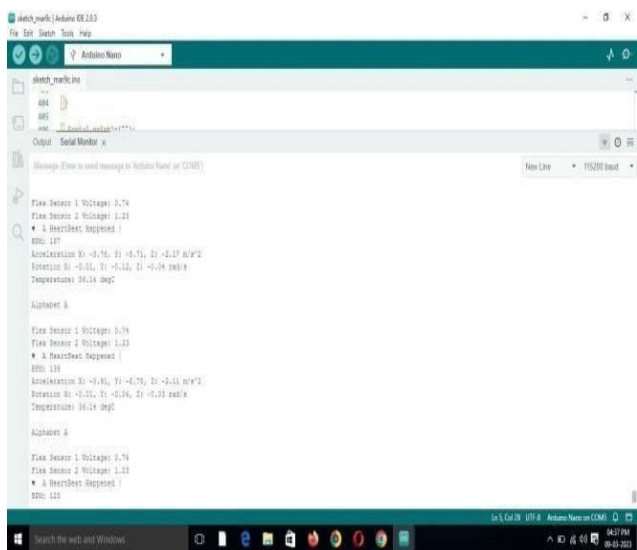


Figure 4. Test Case 1

4.3 Test Case 2

To detect motion in this instance, the flex sensor 1 must be bent all the way to its deepest point. The connected flex sensor 2 for the smart glove will thereafter be at rest. Flex Sensor 1 experiences a change in resistance.

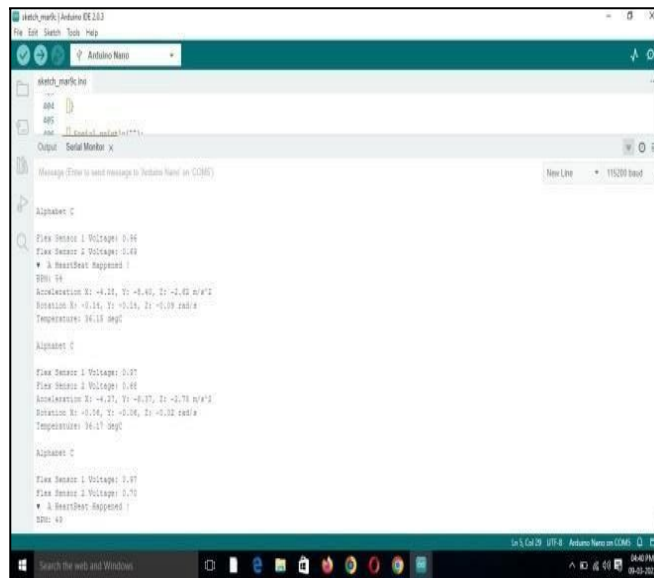


Figure 5. Test Case 2

4.4 Test Case 3

The sample is now only slightly bending at flex sensor 2 for the change in resistance value, while flex sensor 1, which is supposed to be in a resting position, is not moving. The output voltage of the Flex Sensor 2 is thus 0.68 volts. Thus, as shown in the accompanying picture, the results of printing the letter C on the screen.

As a consequence, we have done a few test cases below to demonstrate their relevance in collecting the output from flex sensors. A table has been constructed with the additional test situations. We have merely completed the flex sensor analysis thus far. Nevertheless, we also need to collect the findings from the other sensors. Lastly, we will predict the essential expected result from this system to successfully serve the patient.



Figure 6. Test Case 3

Table 1: Analysis of Flex Sensor Output

S. N O	Sensor	Sensor 1 Status	Sensor 2 Status	Sensor 1 Value	Sensor 2 Value	Alphabets
1	Flex Sensor	Active	Active	0.77	1.19	A
2		Active	Rest	1.11	0.92	B
3		Bend	Active	0.99	0.70	C
4		Bend	Active	1.15	1.39	D

5. Conclusion

We created a smart hand glove for sign language translation in the proposed system. People with and without disabilities will be motivated to engage and learn about themselves as a consequence. Because many technologies have progressed, they have added extra features that increase the quality of life for individuals with impairments. The smart-design glove contains sensors and other aspects that allow it to offer precise results. The gadget may connect to an Android phone and allow message exchange using IOT-based technologies. By upgrading home automation systems, it allows people with paralysis to handle electrical appliances with simple hand gestures. The Smart-Glove is risk-free, lightweight, inexpensive, and easy to use. We are positive that the notion will help patients live more easily in general and that it will enable people with disabilities to enjoy fulfilled lives.

References

[1] Deshpande, B. K., Ara, T., Budhiraja, S., & Gupta, A. (2023). An Intelligent Healthcare System for Quadriplegia Patients using Internet of Things and Machine Learning. *International Neurology Journal*, 27(4), 1-11.

[2] Bhattacharjee, P., Biswas, S., Chattopadhyay, S., Roy, S., & Chakraborty, S. (2023). Smart Assistance to Reduce the Fear of Falling in Parkinson Patients Using IoT. *Wireless Personal Communications*, 130(1), 281-302.

[3] Parameshchhari, B., Sachidananda, C., Rohini, S., Likhitha, K., & Vrinda, G. (2023, June). Communication Through Smart Glasses-An IOT Based Eye Blink Detection. In *2023 International Conference on Applied Intelligence and Sustainable Computing (ICAISC)* (pp. 1-7). IEEE.

[4] Kalpana, H. M., Kulkarni, A. B., Tiwari, M., Chitmalwar, O. R., & TR, R. S. (2023, July). Smart Glove with Gesture Based Communication and Monitoring of Paralyzed Patient. In *2023 International Conference on Smart Systems for applications in Electrical Sciences (ICSSES)* (pp. 1-6). IEEE.

[5] Divya, K. V., Deepthi, N., Aakanksha, A. R., Shree, B., & Abhigina, K. A. (2023, April). An Extensive Review on

Emergency Assistance Applications. In *2023 7th International Conference on Trends in Electronics and Informatics (ICOEI)* (pp. 776-779). IEEE.

[6] Pachamuthu, J. A., Adithan, V., & Veluri, V. V. R. (2023, August). IoT based automatic wheelchair for leg paralyzed person. In *AIP Conference Proceedings* (Vol. 2857, No. 1). AIP Publishing.

[7] Giri, S. R. K. S., Logesh, P., Sundar, S. B., & Praba, R. D. (2023, June). IoT-Based Smart Wheelchair for Disabled People and Patient Monitoring. In *2023 2nd International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA)* (pp. 1-6). IEEE.

[8] Kanna, R.K., Banappagoudar, S.B., Menezes, F.R., Sona, P.S. (2023). Patient Monitoring System for COVID Care Using Biosensor Application. In: Tomar, R.S., et al. *Communication, Networks and Computing. CNC 2022. Communications in Computer and Information Science, vol 1893. Springer, Cham.* https://doi.org/10.1007/978-3-031-43140-1_27

[9] Rout, S. K., Ravinda, J. V. R., Meda, A., Mohanty, S. N., & Kavididevi, V. (2023). A Dynamic Scalable Auto-Scaling Model as a Load Balancer in the Cloud Computing Environment. *EAI Endorsed Transactions on Scalable Information Systems*, 10(5).

[10] Karamchandani, H., Samantaray, R. R., Priyanka, M., Sinchana, S. M., Vandana, R. D., & Jadhav, V. (2023, April). IoT Enabled Health Supervision System for Immobile patients. In *2023 International Conference on Distributed Computing and Electrical Circuits and Electronics (ICDCECE)* (pp. 1-5). IEEE.

[11] Ansari, A. A., Mustafa, M. R., & Soori, P. K. (2023, February). Idealistic Approach of a Comprehensive Physiotherapeutic System Adopting Reconfigurable Robotics and Smart HIS. In *2023 Advances in Science and Engineering Technology International Conferences (ASET)* (pp. 1-6). IEEE.

[12] Kalpana, A. V., Venkataramanan, V., Charulatha, G., & Geetha, G. (2023, June). An Intelligent Voice-Recognition Wheelchair System for Disabled Persons. In *2023 International Conference on Sustainable Computing and Smart Systems (ICSCSS)* (pp. 668-672). IEEE.

[13] Mohanty, S. N., Diaz, V. G., & Kumar, G. S. (Eds.). (2023). *Intelligent Systems and Machine Learning: First EAI International Conference, ICISML 2022, Hyderabad, India, December 16-17, 2022, Proceedings, Part I* (Vol. 470). Springer Nature.

[14] Ahmed, A. S., & Salah, H. A. (2023). Development a Software Defined Network (SDN) with Internet of Things (IoT) Security for Medical Issues. *Journal of Al-Qadisiyah for computer science and mathematics*, 15(3), Page-98.

[15] Moorthi, M., Merisha, R., NithyaRachel, A., & Rajalakshmi, K. (2023, July). A Medicare System for Monitoring And Nerve Stimulation of Immobilized Patients. In *2023 4th International Conference on Electronics and Sustainable Communication Systems (ICESC)* (pp. 1340-1345). IEEE.

[16] Kanna, R.K., Ishaque, M., Panigrahi, B.S., Pattnaik, C.R. (2024). Prediction of Covid-19 Using Artificial Intelligence [AI] Applications. In: Roy, B.K., Chaturvedi, A., Tsaban, B., Hasan, S.U. (eds) *Cryptology and Network Security with Machine Learning. ICCNSML 2022. Algorithms for Intelligent Systems*. Springer, Singapore. https://doi.org/10.1007/978-981-99-2229-1_30

[17] Pancholi, S., Wachs, J. P., & Duerstock, B. S. (2024). Use of Artificial Intelligence Techniques to Assist Individuals with Physical Disabilities. *Annual Review of Biomedical Engineering*, 26.

[18] Kripa, N., Vasuki, R., & Kanna, R. K. (2019). Realtime neural interface controlled au-pair BIMA bot. *International Journal of Recent Technology and Engineering*, 8(1), 992-4.

[19] Madasamy, N. S., Eldho, K. J., Senthilnathan, T., & Deny, J. (2023). A Novel Back-Propagation Neural Network for Intelligent Cyber-Physical Systems for Wireless Communications. *IETE Journal of Research*, 1-13.

- [20] Satyana, I. M. Y. D., Arifin, A., & Hermawan, N. (2023, July). Internet of Things-Based Telemonitoring System Design for Wrist Rehabilitation. In *2023 International Seminar on Intelligent Technology and Its Applications (ISITIA)* (pp. 388-393). IEEE.
- [21] Ravikumar, K. K., Ishaque, M., Panigrahi, B. S., & Pattnaik, C. R. (2023). Detection of Covid-19 Using AI Application. *EAI Endorsed Transactions on Pervasive Health and Technology*, 9.
- [22] Chauhan, R., Upadhyay, J., & Bhatt, C. (2023, March). An innovative wheelchair for quadriplegic patient using IoT. In *2023 International Conference on Device Intelligence, Computing and Communication Technologies, (DICCT)* (pp. 483-487). IEEE.
- [23] Rubi J, A. V, kanna KR, G. U. Bringing Intelligence to Medical Devices Through Artificial Intelligence. *Advances in Medical Technologies and Clinical Practice* [Internet]. 2023 Jan 13;154-68. Available from: <http://dx.doi.org/10.4018/978-1-6684-6434-2.ch007>
- [24] R. K. Kanna, S. Prasath Alias Surendhar, M. R. AL-Hameed, A. M. Lafta, R. Khalid and A. Hussain, "Smart Prosthetic Arm Using Cognitive Application," *2023 3rd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)*, Greater Noida, India, 2023, pp. 1330-1334.
- [25] Agarwal, N., Mohanty, S. N., Sankhwar, S., & Dash, J. K. (2023). A Novel Model to Predict the Effects of Enhanced Students' Computer Interaction on Their Health in COVID-19 Pandemics. *New Generation Computing*, 1-34.
- [26] Morais, D. F., Fernandes Jr, G., Lima, G. D., & Rodrigues, J. J. (2023). IoT-Based Wearable and Smart Health Device Solutions for Capnography: Analysis and Perspectives. *Electronics*, 12(5), 1169.
- [27] Nandagopal, C., Sneha, B., Sriragavi, R., & Veeradarshini, R. (2023, March). Brainwave Sensor based Smart Home Controller for Paralysed People. In *2023 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS)* (pp. 801-807). IEEE.
- [28] Chirchi, V. E., Vivekanand, C. V., Grace, N. V. A., Saranya, R., Venkataramana, S., & Praveena, K. (2023, April). Context Monitoring of Patients using Wireless Network. In *2023 International Conference on Inventive Computation Technologies (ICICT)* (pp. 1266-1271). IEEE.
- [29] Shashidhar, R., Tippannavar, S. S., Sushma, B. S., & Shukla, P. (2023, February). Smart Electric Wheelchair for disabled and paralyzed person using Attention Values on Arduino. In *2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC)* (pp. 1-5). IEEE.
- [30] Kanna, R. K., & Vasuki, R. (2019). Advanced Study of ICA in EEG and Signal Acquisition using Mydaq and Lab view Application. *International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN, 2278-3075*.
- [31] Ghosh, H., Tusher, M.A., Rahat, I.S., Khasim, S., Mohanty, S.N. (2023). Water Quality Assessment Through Predictive Machine Learning. In: *Intelligent Computing and Networking. IC-ICN 2023. Lecture Notes in Networks and Systems*, vol 699. Springer, Singapore. https://doi.org/10.1007/978-981-99-3177-4_6