GestureLink: Wireless Hand Gesture Control Glove

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TEAM SP24-38

Abstract

GestureLink is a glove that will assist in home automation tasks. This device will possess the ability to accurately detect and interpret gestures using machine learning algorithms. These gestures will enable users to seamlessly control wireless devices within the vicinity of the glove based on the gestures that are inputted.

Motivations and Objectives

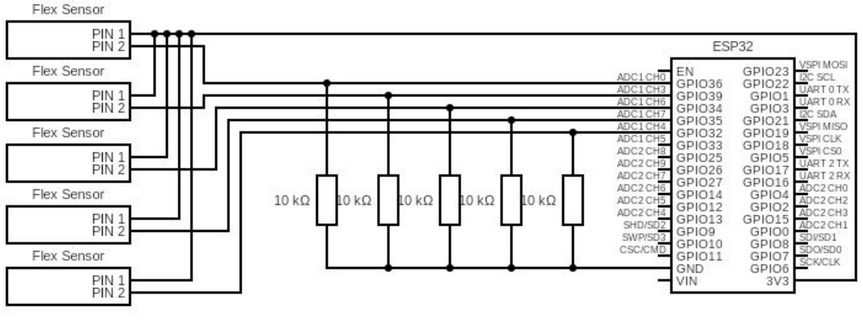
The main motive was to make a glove that would be able to help physically ailed individuals with interacting with wireless devices with a simple gesture. The target audience would be those who are in hospice or are in constant need of assistance with simple tasks such as turning on the lights.

Project Challenges

- The initial choice of sensors (cheaper option) did not fit the intended functionality of our project
- The delayed delivery of new hardware halted progress for a few weeks. The order portal claimed one of our parts was ordered but it was never fully processed.

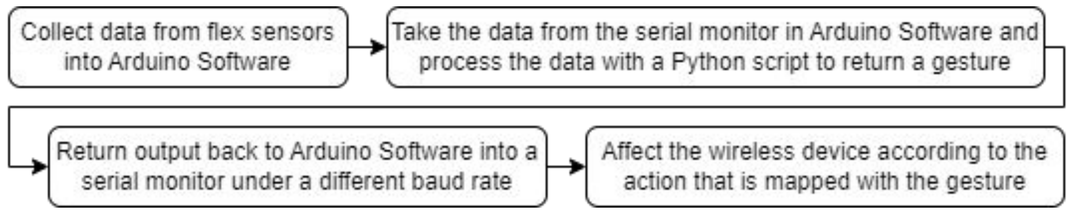
Hardware

The glove is composed of an ESP32 microcontroller and five flex sensors for the inputs.



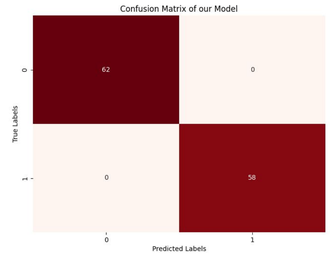
Software

- We will use Arduino Software and PyCharm as our IDEs
- Recognition of gestures will be achieved through machine learning algorithms (SVM) using the scikit library in Python
- The device will communicate with other ESP32 microcontrollers using the ESP-NOW wireless communication protocol



Machine Learning Accuracy

When testing the accuracy of our trained model with five unique gestures (resting position, fist, point, rock gesture, peace sign), we were able to get extremely accurate results



Future Work

- Give the users the ability to map custom gestures to specific actions of their choice
- Accompany the device with a mobile or web application with added features

Project Impact

- These gloves would make a world of a difference to the target audience as it would provide them with a sense of independence and freedom whilst reducing the load on nurses that usually care for them.
- These gloves could be improved upon and have uses in other fields where gestures could be used to achieve different functions.

References

[1] https://docs.espressif.com/projects/esp-idf/en/stable/esp32/api-reference/network/esp_now.html
[2] https://scikit-learn.org/stable/modules/svm.html

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