SSIP Annual International Conference on Student Innovation, Startup and Ecosystem

AI Enabled Wearable for Human Gestures Recognition

Name : Dhwani Trivedi || Mentor : Dr. Rajvirsinh Rana

Birla Vishwakarma Mahavidhyalaya Engineering College
Vallabh Vidhyanagar, Anand, Gujarat. India

Abstract

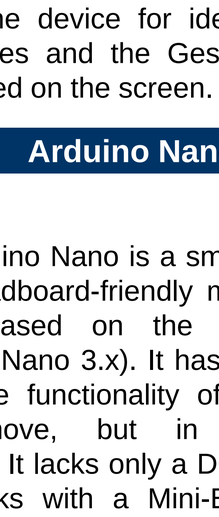
We are living in a world where people are not equal in terms of physical abilities. We wish to count the ability and not the disability by lifelong learning. Every disabled person has right to learn and grow through life long learning. The disability should not be a hurdle to acquire capabilities of lifelong learning. . I have developed a very small AI enabled wearable prototype for identifying gestures of most of the human activities (HAR- Human Activity Recognition). For life long learning and creating further capabilities such low cost and easy to use open source hardware can elevate the confidence level of PWD, The hardware is capable generating alphanumeric characters, words, sentences or controlling any apparatus by providing required training data for small AI enabled hardware. The technology is open source and uses easy to access hardware. The device is multifaceted and can be used for old age people to learn even.

Basic Steps

1. Connect the Arduino Nano Board with the 6-axis accelerometer, Bluetooth module, battery and switch.
2. Install the Pygarl Library for Gestures
3. Record the training samples for various human gestures.
4. Train the recorded samples using the SVM classifier.
5. Use the device for identifying the Gestures and the Gesture will be detected on the screen.

Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly microcontroller board based on the ATmega328P (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. It is very low cost and open source hardware with huge libraries support. The I2C pins D2 and D3 are used to connect directly to the MPU-6050 SCL and SDA pins to obtain data for x, y and z axis acceleration and gyro data for raw, pitch and yaw.

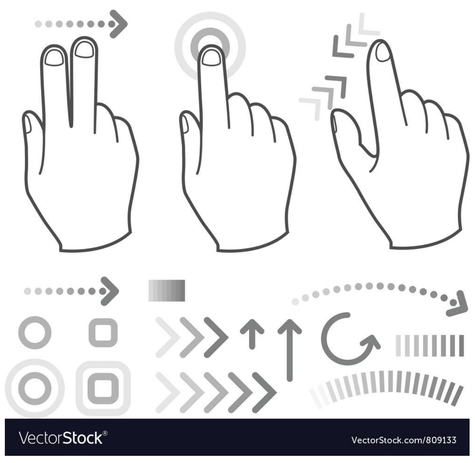


Human Activity / Gestures

A gesture is a form of non-verbal communication or non-vocal communication in which visible bodily actions communicate particular messages, either in place of, or in conjunction with, speech. Gestures include movement of the hands, face, or other parts of the body.

Hand Movements or Gestures

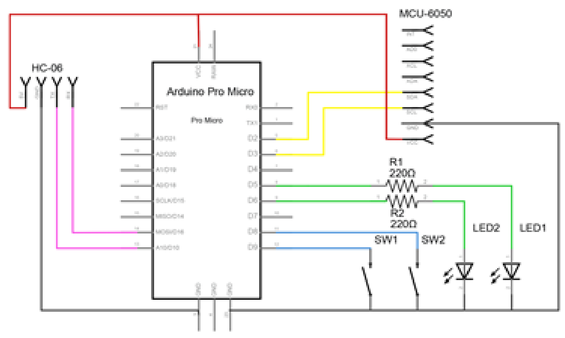
This are various Hand Gestures that can be used for communication and using this gestures they can be used for training the AI model.



MPU-6050 (Accelerometer)

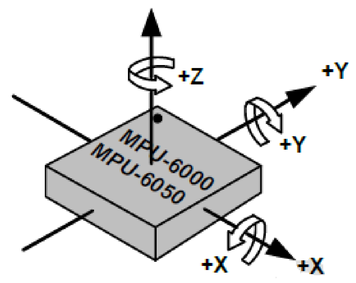
MPU-6050 is an built in motion processor which works as an accelerometer and it processes the values from the value from the accelerometer and gives the data in form of 3D values and the data that we get is used for training our gesture model. The MPU-6050 provides x, y and z direction acceleration values and row, pitch and yaw angles for better recognition of human gestures. It is very low cost sensor. The power consumption of this MEMS device is very low.

Circuit Diagram



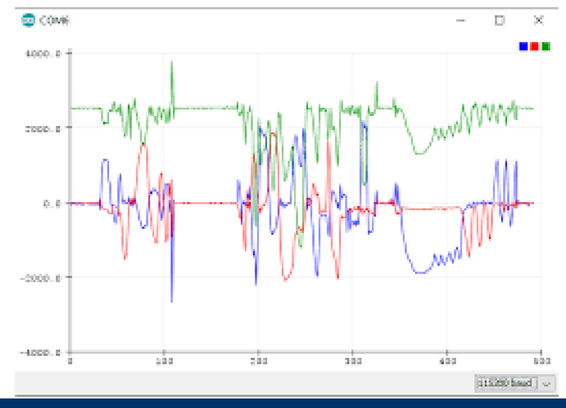
Accelerometer Axis

The MPU-6050 accelerometer provides acceleration values and gyro angles as shown in the below figure. This is also known as six degree of freedom



Accelerometer Graph

The serial monitor output for the data received from MPU-6050 for various human activity

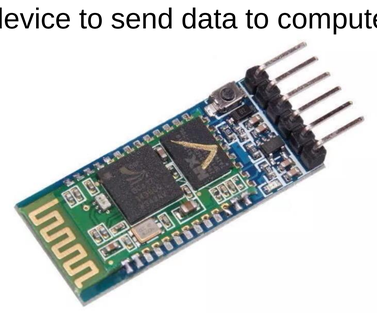


Lithium Polymer Battery

Li-Po battery 3.7V, 180mAh has very small size and accommodates in a very small space, a best candidate for wearables.

HC-05 Bluetooth Module

HC-05 is a very popular Bluetooth modem and is used as serial input device to send data to computer.



Functional Prototype

Application and Future Scope

The wearable is created to demonstrate the open source hardware with AI, and it explains how this system can be used for students with disabilities and in mainstream schooling or adult education. Examples are like writing using gestures for people with speech disabilities or no body movement, it can also be used to generate various sentences from human gestures in future.

Acknowledgement

The author is thankful to Dr. Rajvirsinh Rana, Mentor, Dr. Bhargav Goradiya, HoD and Dr. Indrajit Patel, Principal – BVM Engineering College for encouragement, support and guidance under SSIP.

Contact Information

Dhwani Trivedi
Email ID : dhwanitrivedi999@gmail.com
EC Department, BVM Engineering College, Vallabh Vidhyanagar, Anand, Gujarat