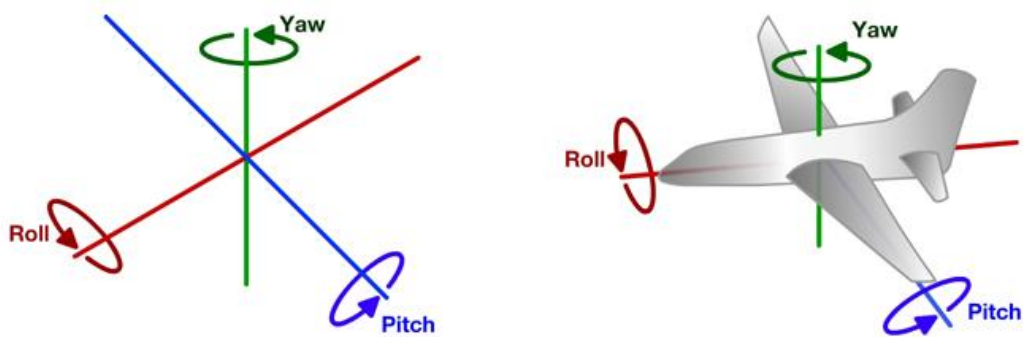


The objective:

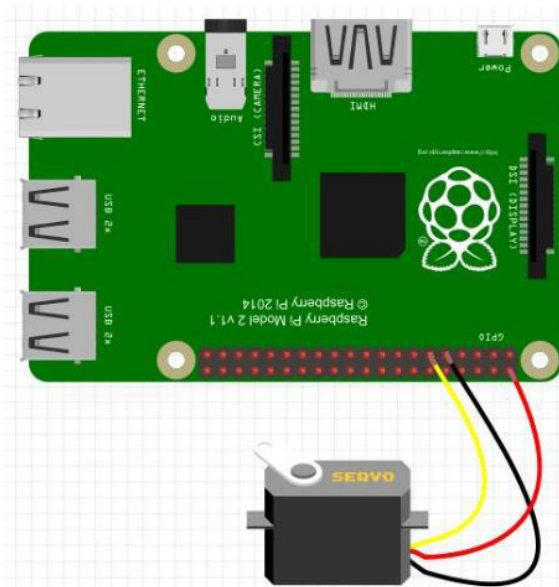
The main objective in our project is to control the servo motor movement according to the IMU sensor.

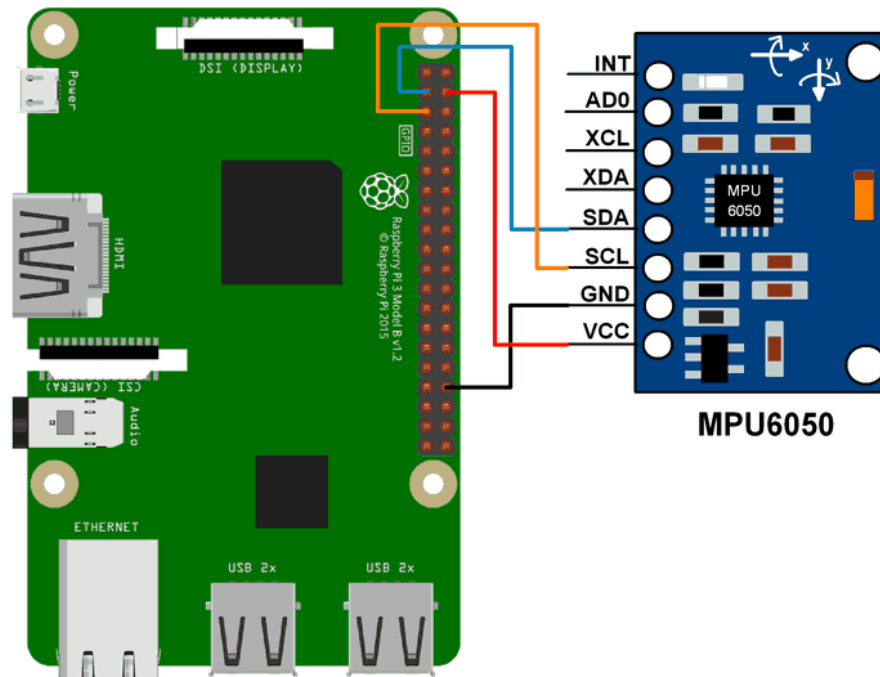
We exactly need to simulate the movement of an artificial limit that move in the “Roll” direction and stops when the “Pitch” direction reaches 60 degrees. And it sweeps again when we move the sensor under 60 degrees in pitch direction.



Hardware:

1. Raspberry Pi
2. IMU sensor
3. MPU-6050 Servo





Libraries:

1. SMBus:
To access I2C bus on Raspberry Pi.
2. Kalman:
To filter the data from IMU sensor.

Steps:

1. We use Kalman filter to filter the readings data from the sensor because MPU-6050 Servo is very noisy.
2. We then make a function that map the filtered angles from Kalman to duty cycle to sweep the motor in the same direction as the IMU sensor.

Problems we faced:

1. We originally want to sweep the servo in the "Yaw" direction but our servo is 6 degree of freedom but only 9 degree of freedom can measure "Yaw" so this is a limitation on our original objective. Thus, we used "roll" instead of "Yaw".

2. Practically, we faced a problem in the sweeping of the servo that the servo was moving slowly and in sometimes did not even sweep. This was because that the value of the PWM was not large enough to sweep the servo. So, we multiply the value of the angle in the duty cycle equation by a factor to increase the duty cycle. This work sufficiently with our intended results.

$$DC = (\text{abs}(\text{roll}) * 1.5) / 18 + 2$$