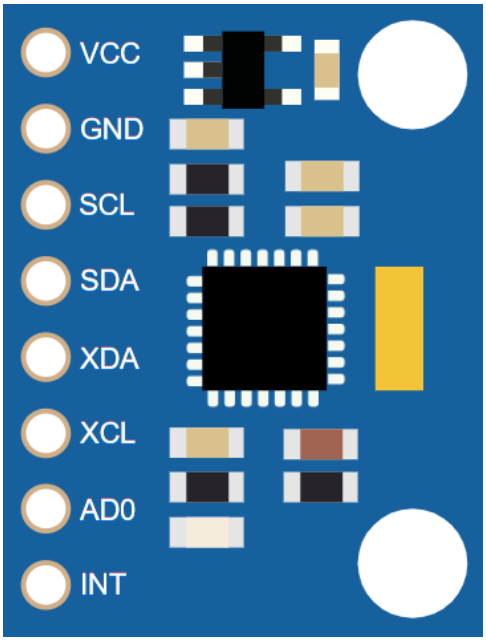
MPU 6050

Definition:

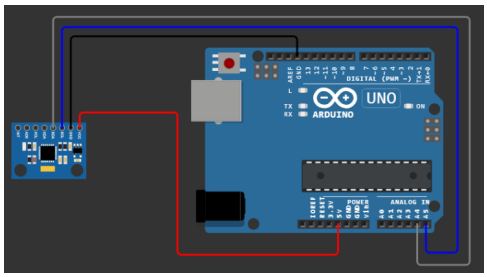
Integrated sensor with 3-axis accelerometer, 3-axis gyroscope and a temperature sensor with I2C interface.

Datasheet:

Name	Description
VCC	Voltage supply
GND	Ground
SCL	I2C clock line
SDA	I2C data line
XDA	Unused
XCL	Unused
AD0	Address select pin
INT	Interrupt



Simulation link on Wakwi



Code:

```
//define registers
#define IMU_ADD 0x68
#define GYRO_CONFIG 0x1B
#define PWR_MGMT_1 0x6B
#define ACCEL_ZOUT_H 0x3F
#define GYRO_ZOUT_H 0x43
#include <Wire.h>
// MPU6050 variables
int16_t acc_X, acc_Y, acc_Z;
int16_t gyr_X, gyr_Y, gyr_Z;
float yaw_angle;

void setup() {
  Serial.begin(115200);

  //I2C communication
  Wire.begin();
  // Wake up MPU6050
  Wire.beginTransmission(IMU_ADD);
  Wire.write(PWR_MGMT_1);
  Wire.write(0);
  Wire.endTransmission(true);

  // Configure gyroscope range
  Wire.beginTransmission(IMU_ADD);
  Wire.write(GYRO_CONFIG);
  Wire.write(0x00);  // Set full-scale range to ±250 degrees per second
  Wire.endTransmission(true);
}
void loop() {
  // Read accelerometer data
  Wire.beginTransmission(IMU_ADD);
  Wire.write(ACCEL_ZOUT_H);
  Wire.endTransmission(false);
  Wire.requestFrom(IMU_ADD, 6, true);
  acc_X = Wire.read() << 8 | Wire.read();
  acc_Y = Wire.read() << 8 | Wire.read();
  acc_Z = Wire.read() << 8 | Wire.read();

  // Read gyroscope data
  Wire.beginTransmission(IMU_ADD);
  Wire.write(GYRO_ZOUT_H);
  Wire.endTransmission(false);
  Wire.requestFrom(IMU_ADD, 6, true);
  gyr_X = Wire.read() << 8 | Wire.read();
  gyr_Y = Wire.read() << 8 | Wire.read();
  gyr_Z = Wire.read() << 8 | Wire.read();

  // Convert raw gyroscope values to degrees per second
  float gyroScale = 250.0 / 32767.0;  // ±250 degrees per second
  float gyro_X_deg = gyr_X * gyroScale;
  float gyro_Y_deg = gyr_Y * gyroScale;
```

```
  float gyro_Z_deg = gyr_Z * gyroScale;

  // Calculate yaw angle
  yaw_angle+= (gyro_Z_deg / 1000.0) * (180.0 / PI);  // Integration over time

  // Print yaw angle
  Serial.print("Yaw Angle: ");
  Serial.println(yaw_angle);
  delay(1000);
}
```

Q: If the sensor is surrounded by a noisy environment, What type of filter could be used and what is the recommended cutoff frequency depending on the sensor datasheet?

According to the datasheet for the MPU6050, both the gyroscope and accelerometer can be sampled at frequencies ranging from 1 to 8 kHz. However, due to limitations imposed by the SD (Secure Digital) module, the maximum achievable sample rate is reduced to 500 Hz. This reduced sample rate is still sufficient for many applications. For further details and specifications, please refer to the complete datasheet of the MPU6050.