Al-Mustaqbal University

College Of Engineering & Technology

Department of Computer Engineering Techniques

(Stage: 3)

Digital Control

Lecture 9

Arduino programming

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Arduino with PIR Motion Sensor

In this project you're going to create a simple circuit with an Arduino and PIR motion sensor that can detect movement. An LED will light up when movement is detected.

Introducing the PIR Motion Sensor

The PIR motion sensor is ideal to detect movement. PIR stand for "Passive Infrared". Basically, the PIR motion sensor measures infrared light from objects in its field of view.

So, it can detect motion based on changes in infrared light in the environment. It is ideal to detect if a human has moved in or out of the sensor range.
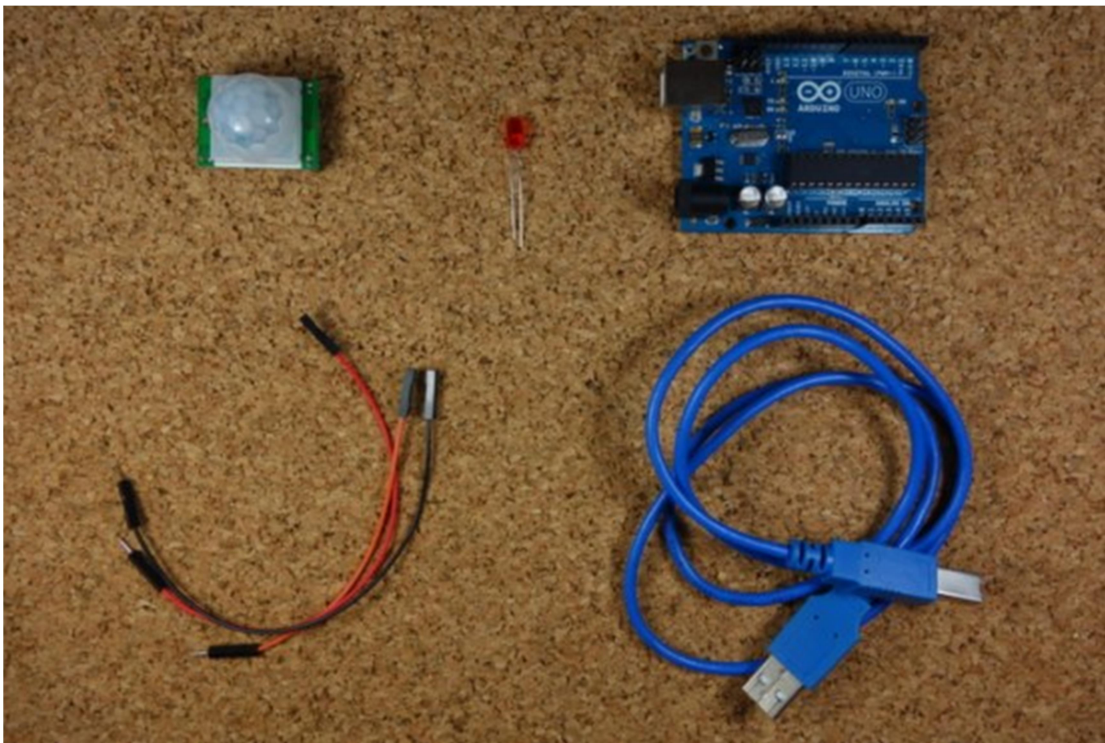
The sensor in the figure above has two built-in potentiometers to adjust the delay time (the potentiometer at the left) and the sensitivity (the potentiometer at the right).

Pinout

Wiring the PIR motion sensor to an Arduino is pretty straightforward – the sensor has only 3 pins.

- GND – connect to ground
- OUT – connect to an Arduino digital pin
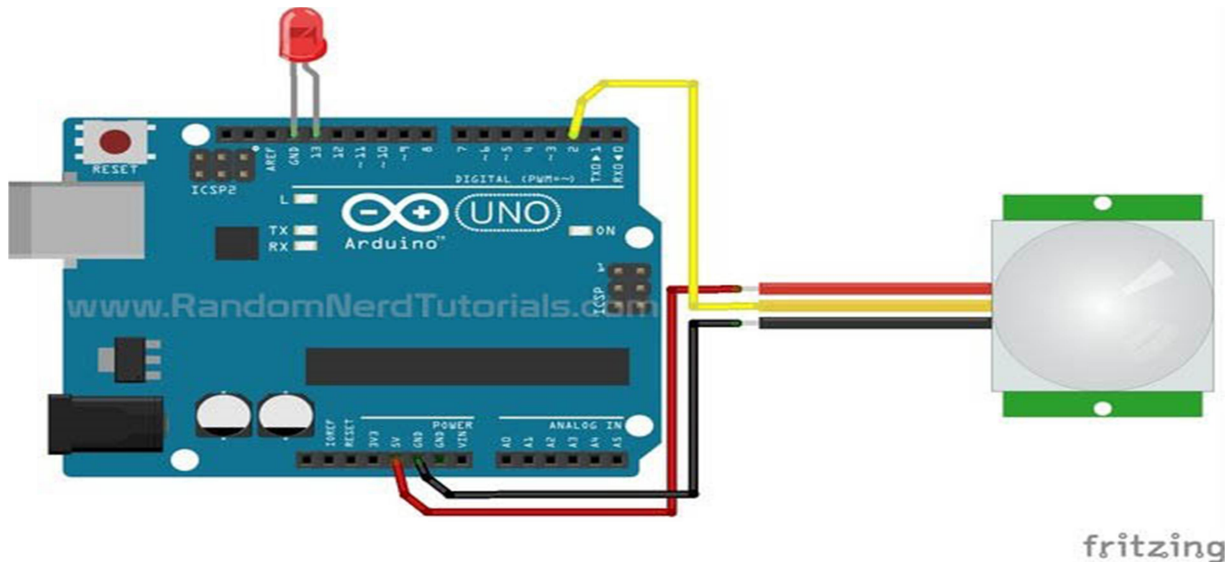- 5V – connect to 5V

Parts required

Here's the required parts for this project

- 1x PIR Motion Sensor (HC-SR501)
- Arduino UNO
- 1x LED

- Jumper Cables

Schematics

Assemble all the parts by following the schematics below.

Code

```
int led = 13;              // the pin that the LED is
atteched to
int sensor = 2;            // the pin that the sensor is
atteched to
int state = LOW;           // by default, no motion
detected
int val = 0;               // variable to store the sensor
status (value)

void setup() {
  pinMode(led, OUTPUT);      // initalize LED as an output
  pinMode(sensor, INPUT);    // initialize sensor as an input
  Serial.begin(9600);        // initialize serial
}

void loop(){
  val = digitalRead(sensor);   // read sensor value
```

```
  if (val == HIGH) {            // check if the sensor is HIGH
    digitalWrite(led, HIGH);    // turn LED ON
    delay(100);                 // delay 100 milliseconds

    if (state == LOW) {
      Serial.println("Motion detected!");
      state = HIGH;        // update variable state to HIGH
    }
  }
  else {
      digitalWrite(led, LOW); // turn LED OFF
      delay(200);                 // delay 200 milliseconds

      if (state == HIGH){
        Serial.println("Motion stopped!");
        state = LOW;         // update variable state to LOW
    }
  }
}
```
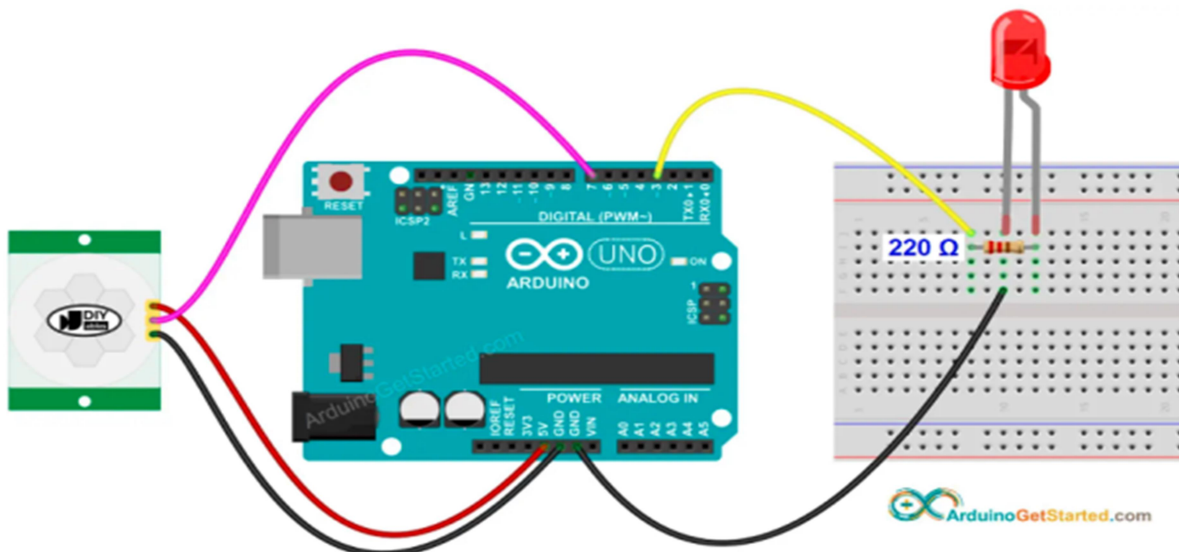
We are going to learn how to use Arduino to turn on/off the LED according to the motion detection from the HC-SR501 motion sensor:

◆— If the motion is detected, turn LED on

◆— If the motion is not detected, turn LED off

```
const int MOTION_SENSOR_PIN = 7;
const int LED_PIN          = 3;
int motionStateCurrent     = LOW;
int motionStatePrevious    = LOW;
void setup()
{
  Serial.begin(9600);
  pinMode(MOTION_SENSOR_PIN, INPUT);
  pinMode(LED_PIN, OUTPUT);
}
void loop()
{
  motionStatePrevious = motionStateCurrent;          // store old state
  motionStateCurrent  = digitalRead(MOTION_SENSOR_PIN); // read new state
  if (motionStatePrevious == LOW && motionStateCurrent == HIGH)
{
    Serial.println("Motion detected!");
    digitalWrite(LED_PIN, HIGH);
  }
  else
  if (motionStatePrevious == HIGH && motionStateCurrent == LOW)
{
    Serial.println("Motion stopped!");
    digitalWrite(LED_PIN, LOW);
  }
}
```