

Ex. No. 3a. Raspberry Pi Based ON/OFF Control Based on Light Intensity

OBJECTIVE:

To monitor the surrounding light intensity & automatically turn ON/OFF the high intensity LED's by taking some pre-defined threshold light intensity value using the light sensors.

REQUIRED COMPONENTS:

- A Raspberry pi
- 1 x breadboard
- A Photocell
- A Resistor
- A Capacitor (1 microfarad)
- Jumper Wires
- Connectors

BACKGROUND THEORY:

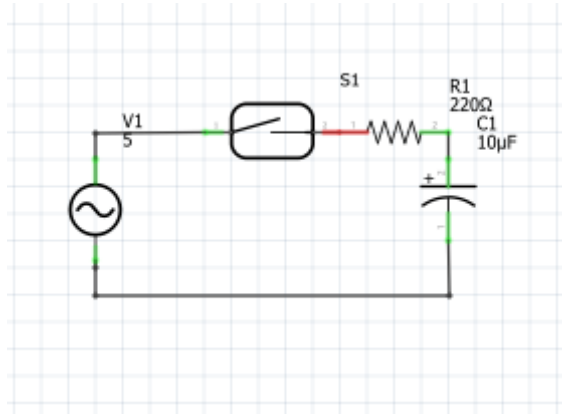
Photocell



The Photocell is a light sensor in which the resistance varies according to the intensity of light. The resistance reduces when it is in brighter surroundings. We have to set up a threshold value for the measurements of the intensity because it cannot give the precise measurements. If the measurements are below the threshold then it is dark, else it is bright.

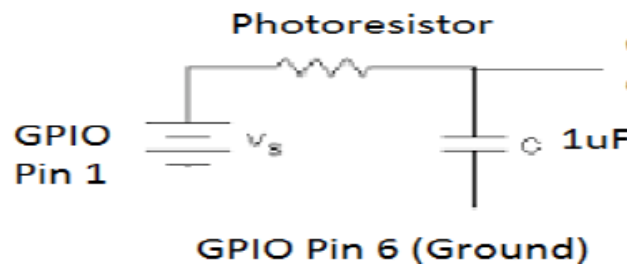
Role of a Capacitor

A Capacitor is an electrical component that can store electrical energy temporarily. It is measured in Farads which is characterized by capacitance. The capacitor consists of 2 conductors that can hold the electric charge and when it is fully charged the capacitor starts discharging. This kind of alternative behavior is used to generate AC.



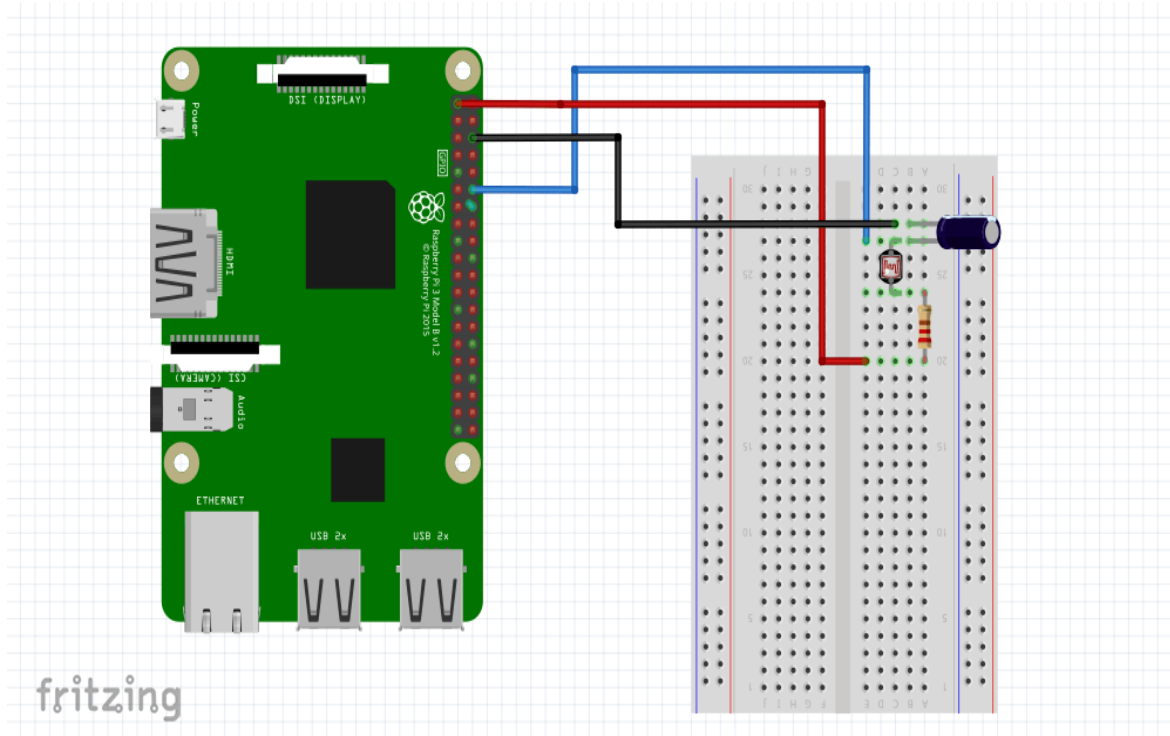
When the switch is pressed the current starts flowing and the capacitor starts charging up. The capacitor stops charging when the voltage at its end reaches the voltage of the battery. Then as there is no potential difference in the upper half of the circuit, no current flows there.

Circuit Diagram:



We need to measure the resistance of the photoresistor. The Raspberry pi acts as the battery whereas the GPIO pin 1 provides 3.3 V to the photoresistor. Make the GPIO pin 12 as the bidirectional pin (input and output pin). When the capacitor is charging it will take some time to reach a voltage that registers as high. GPIO pin 6 is grounded which is connected to the negative side of the capacitor (short end). Check how long it takes for the input pin to become high and use the result to calculate the resistance of the photocell.

WORKING:



- Insert a photocell in a breadboard.
- Connect the GPIO pin 1 (3.3 V) to the resistor which is connected serial to the Photocell.
- Connect the other end of the photocell to the GPIO pin 12 and the Capacitor as shown in the diagram.
- GPIO pin 6 (ground) is connected to the other end of the capacitor (short end).

Code

```
#measuring the light intensity using a photocell
import RPi.GPIO as GPIO,time,os      #import the libraries
DEBUG=1
GPIO.setmode(GPIO.BOARD)
GPIO.setwarnings(False)
def RCtime(RCpin): # function startreading=0
    GPIO.setup(RCpin,GPIO.OUT)
    GPIO.output(RCpin,GPIO.LOW)
    time.sleep(2)                # time to discharge capacitor
```

```

GPIO.setup(RCpin,GPIO.IN)
while (GPIO.input(RCpin) == GPIO.LOW):
# the loop will run till the capacitor is charged
    reading += 1
# measuring time which in turn is measuring resistance
return reading
# function

while True:
    print Rctime(12) # calling the function

```

Output

1. With light:

```

Python 3.5.3 (default, Jan 19 2017, 14:11:04)
[GCC 6.3.0 20170124] on linux
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: /home/pi/dev/tryAWS/ldr_data.py =====
219
222
218
223
222
221
212
290
225
220
225
222
222
224
224
218
220
211
225
227
201
220
227
229
222
225
226
218
225
224

```

2. Without light:

```

Python 3.5.3 (default, Jan 19 2017, 14:11:04)
[GCC 6.3.0 20170124] on linux
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: /home/pi/dev/tryAWS/ldr_data.py =====
3027
2993
2979
2981
2959
2986
2962
2992
2987
2878
2964
3011
2938
2907
2950

```

CONCLUSION:

Thus a simple application to monitor the surrounding light intensity & automatically turn ON/OFF the high intensity LED's by taking some pre-defined threshold light intensity value using the light sensors is developed successfully.