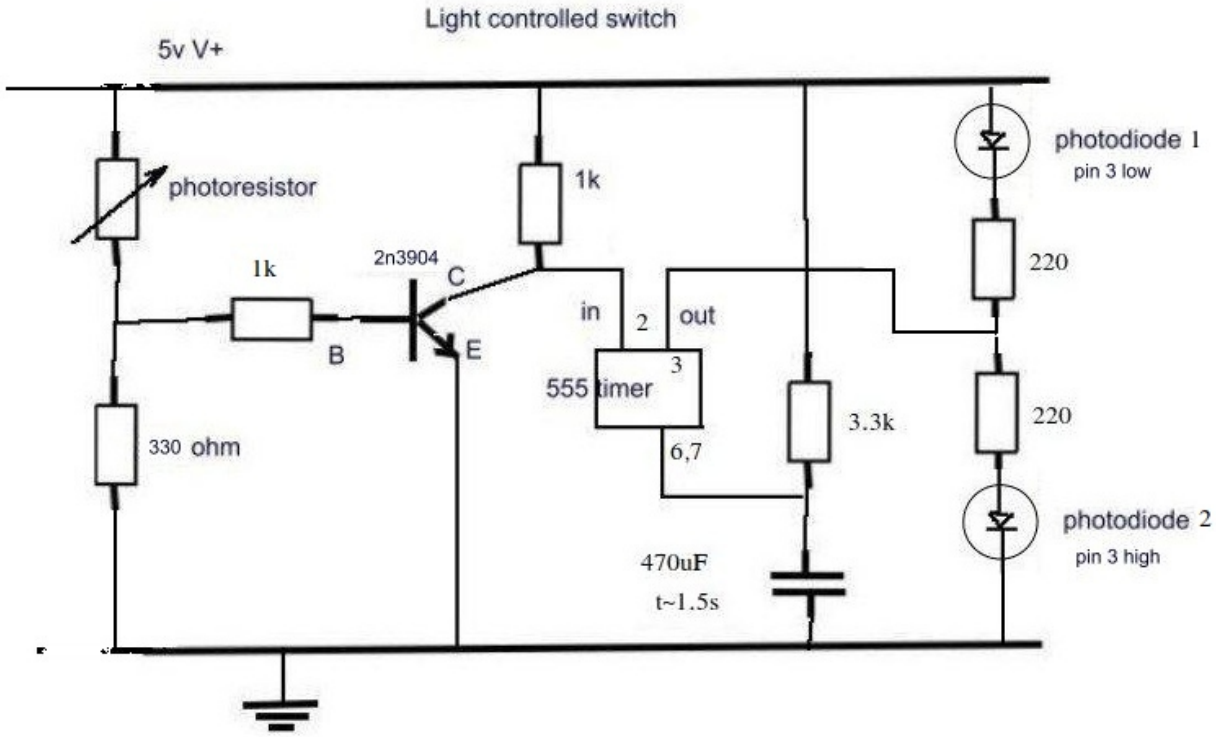
Light Active Switch

Light Switch

Is an Arduino project in which we construct a circuit that can be activated by shining a light on the sensor.

It incorporates a photoresistor sensor (KLS6-3537), an n3904 transistor switch and a 555 timer monostable. The signal propagates through the circuit and the arduino uno detects and plots the signal change at each stage.

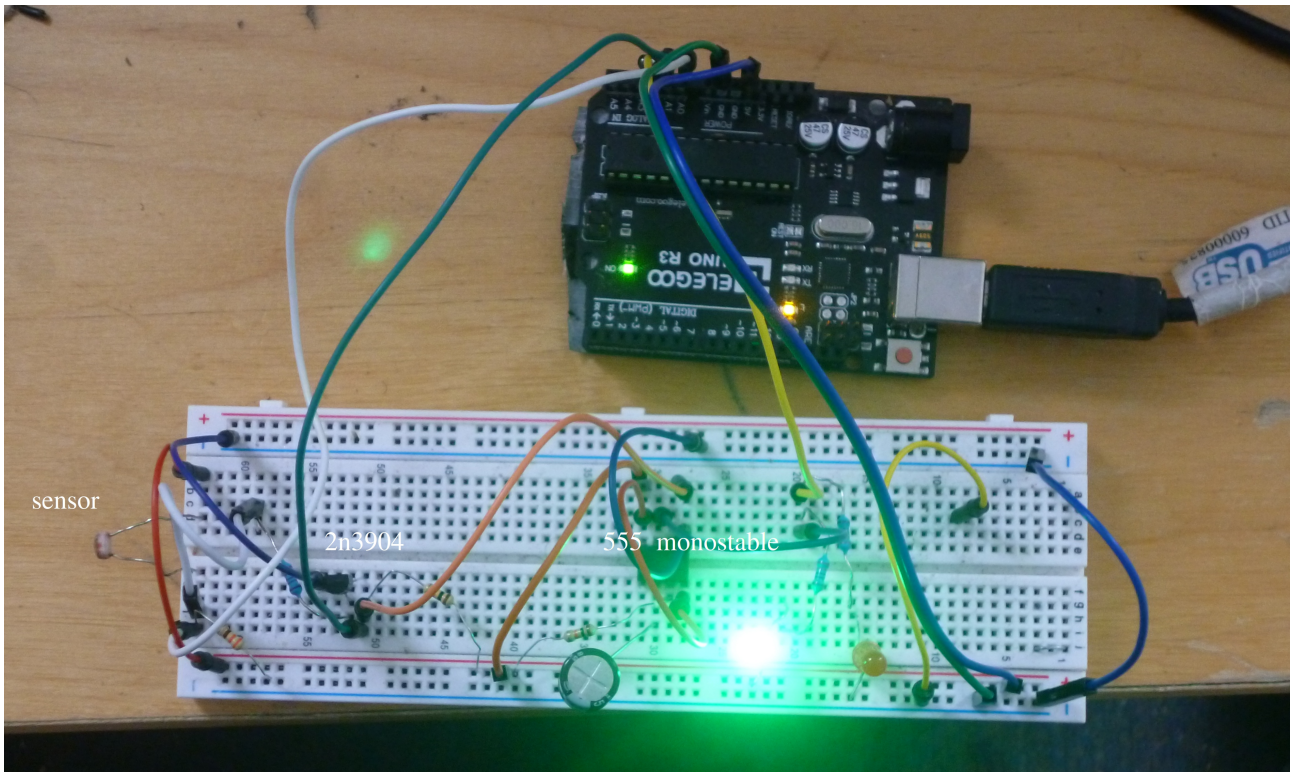


In this form of the circuit, in quiescent conditions with reduced light on the photoresistor photodiode 2 lights and photodiode 1 is off. When alight is shone on the photorestor sensor, photodiode 1 lights and photodiode 2 goes out. This state lasts until the light stops shining on the sensor. When light stops shining on the sensor, photodiode 1 stays on for the duration of the delay implemented on the 555 timer.

In the sensor portion of the circuit the photoresistor is balanced against a 330 ohm resistor as a voltage divider such that at low light values the voltage may lay between 0.22v and 0.11v. When light shines on the sensor it quickly rises to more than 1.0v. This voltage feeds to the base of the transistor which in turn drags the collector voltage from near 5v down to less than 1v. This in turn

triggers The 555 timer that sets pin 3 high for the duration of pin 2 staying low. When pin 2 turns high pin 3 stays high according to the r-c timer circuit connected to pins 6 and 7.

Strictly speaking, to use the circuit as a switch, photodiode 1 would be replaced by a relay that switch on whatever device required when pin 3 of the monostable turns high.



equipment

Arduino uno

Photoresitor

transistor n3904

555 timer

resistors

1 x 330 ohm, 2 x1k, 2 x 220 ohm, 1 x 3.3k

470uF capacitor

2 x photodiode

15 male – male breadboard wires

830 tie-point plug -in Solderless Breadboard,

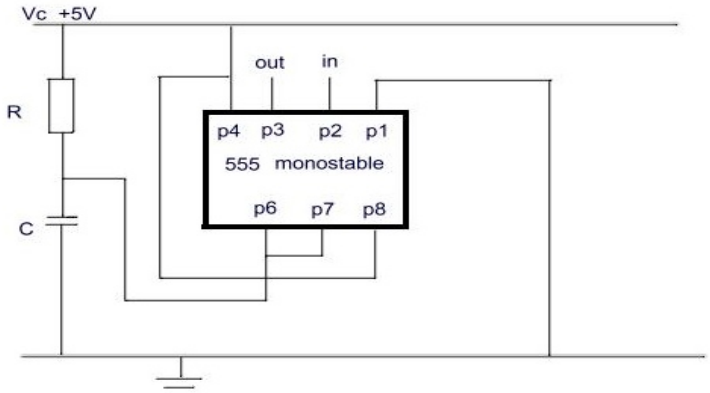
Analog Read

The Arduino Uno has ideal analogue voltage reading ability on ports A0 to A5. They are highly sensitive ports and have a 10bit resolution and may make reading with a current as low as 10 uA.

To measure the signal at the different stages our setup uses A0 to measure the voltage at the low side of the photoresistor, A1 to measure voltage at the collector terminal of the transistor and A2 to track the voltage on pin 2, the output of the monostable.

Wiring of the 555 monostable

Below is illustrated the full connections of the thee 555 monostable including the supply and ground connections.



Software

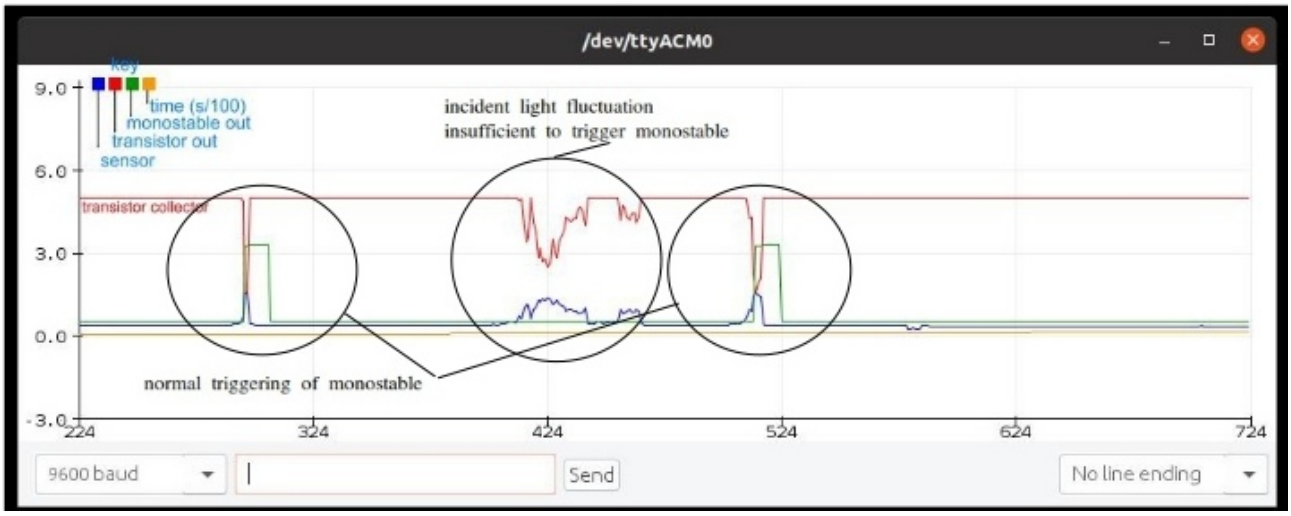
Below is the arduino sketch used to acquire a plot of the working of this circuit.

```
//Photoread
//Tunde Adeyemo
// 01/03/21


int R0 = 0,R1 = 1,R2 = 2;
float V,V1,V2,vx =5.0 ;
void setup()
{
  Serial.begin(9600);
}
void loop()
{
  V =vx/1024*analogRead(R0);
  V1 =vx/1024*analogRead(R1);
  V2 =vx/1024*analogRead(R2);
  Serial.print(V);Serial.print(" \t");
  Serial.print(V1);Serial.print(" \t");
  Serial.print(V2);Serial.print(" \t");
  Serial.println(millis()/1000000.0);  // print time in secs/100 to stop the time plot becoming disproportionate
  delay(200);
}
```

Results

Below shows a plot of a trial run.



Further reading

https://components101.com/microcontrollers/arduino-uno

https://learn.sparkfun.com/tutorials/transistors/applications-i-switches

www.555-timer-circuits.com/operating-modes.html