EXPERIMENT NO. 5

Aim : To interface light dependent resistor (LDR) with Arduino UNO and write a program to turn on and off an indicator upon dark detection.

Apparatus Required : LDR(Light Dependent Resistor), Arduino UNO Board, 1kΩ Resistor, Jumper wires.

Theory :

LDR (Light Dependent Resistor) as the name states is a special type of resistor that works on the photoconductivity principle means that resistance changes according to the intensity of light. Its resistance decreases with an increase in the intensity of light. It is often used as a light sensor, light meter, Automatic Street lights, and in areas where we need to have light sensitivity. It is also called a Light Sensor.

LDR are usually available in 5mm, 8mm, 12mm and 25mm dimensions.

The LDRs made with photosensitive semiconductor materials like Cadmium Sulphides (CdS), lead sulphide, lead selenide, indium antimonide or cadmium selenide and they are placed in Zig-Zag shape as you can see in the pic below, and two metal contacts are placed on both ends of the Zig-Zag shape these metal contacts helps in creating a connection with the LDRs.

Now, a transparent coating is applied on the top so that the zig-zag shaped photosensitive material gets protected and as the coating is transparent the LDR will be able to capture light from the outer environment for its working.

Working and Principle :

It works on the principle of photoconductivity whenever the light falls on its photoconductive material, it absorbs its energy and the electrons of that photoconductive material that is in the valence band get excited

and go to the conduction band and thus increasing the conductivity as per the increased in light intensity.

Also, the energy in incident light should be greater than the bandgap gap energy so that the electrons from the valence band got excited and go to the conduction band.

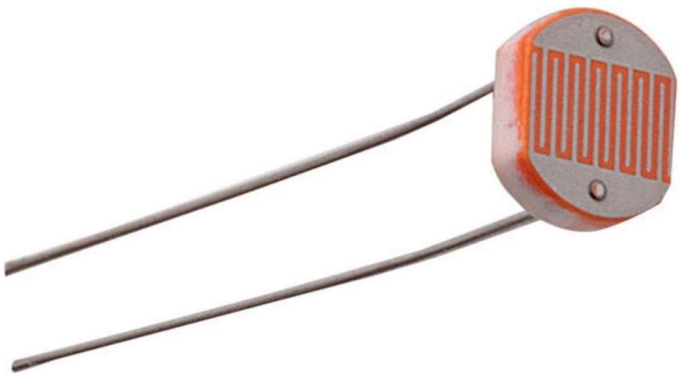
The LDR has the highest resistance in dark around 1012 Ω and this resistance decreases with the increase in Light.

The LDR gives out an analog voltage when connected to VCC (5V), which varies in magnitude in direct proportion to the input light intensity on it. That is, the greater the intensity of light, the greater the corresponding voltage from the LDR will be. Since the LDR gives out an analog voltage, it is connected to the analog input pin on the Arduino. The Arduino, with its built-in ADC (analog-to-digital converter), then converts the analog voltage (from 0-5V) into a digital value in the range of (0-1023). When there is sufficient light in its environment or on its surface, the converted digital values read from the LDR through the Arduino will be in the range of 0-1023.

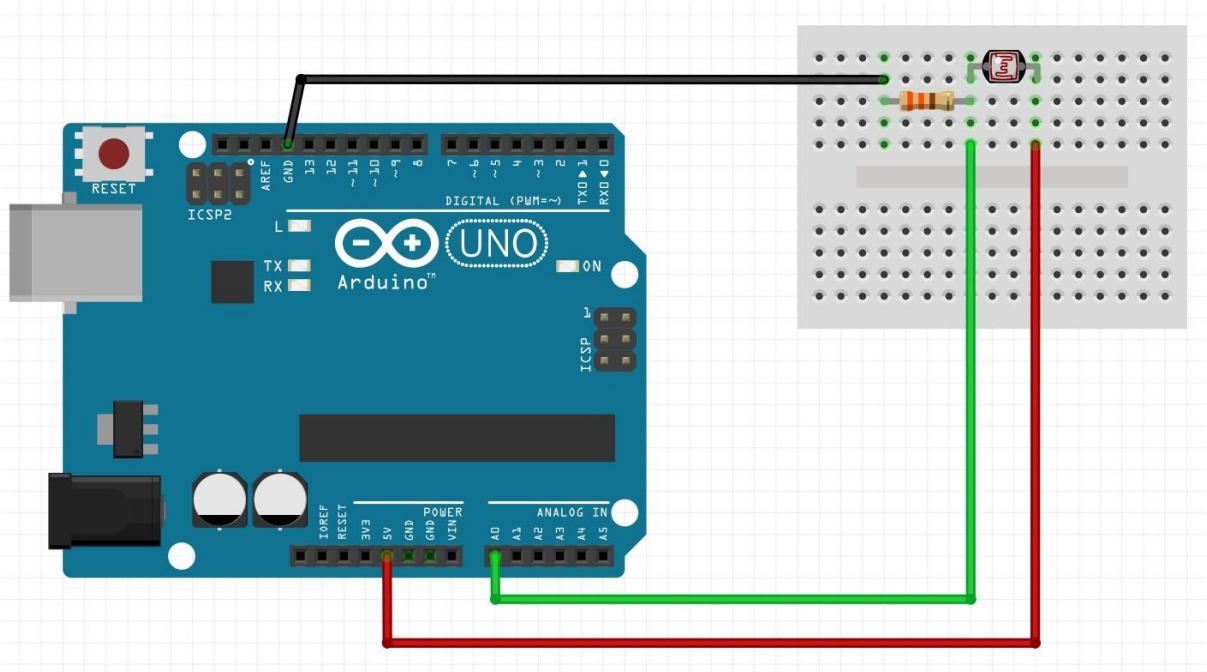
Furthermore, we then program the Arduino to turn on a relay. Correspondingly, turn on an appliance (light bulb), when the light intensity is low (this can be done by covering the surface of the LDR with any object), that is, when the digital values read are in a higher range than usual.

Light intensity V/S Resistance:

As per the property of LDRs, the amount of light entering the LDR the inversely proportional to the resistance of the sensor, and the graph is hyperbolic in nature



Circuit Diagram:



Code :

```
int LDRpin= A0;
int LDRvalue=0;

void setup() {
Serial.begin(9600);
pinMode(LED_BUILTIN,OUTPUT);
}
void loop() {
LDRvalue= analogRead(LDRpin);
if(LDRvalue<100)
digitalWrite(LED_BUILTIN,HIGH);
else
digitalWrite(LED_BUILTIN,LOW);
Serial.println(LDRvalue);
delay(1000);
}
```

Result : Hence, We successfully interfaced LDR with Arduino UNO and wrote a program to turn on and off an indicator upon dark detection.