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Laboratory 3:

Part 1:Experimental equipment and devices

1. Arduino Development Board

2. Matlab

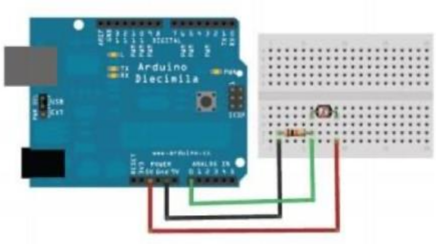
3.Breadboard

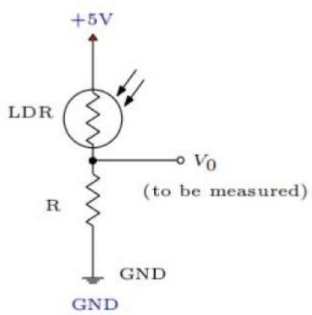
4.Resistors (LDR)

Part 2:Experimental content

Implementing a circuit to capture a signal from a light sensor to measure ambient light.

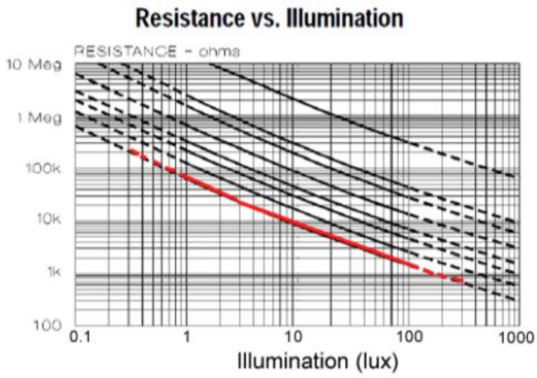
Part 3:Experimental procedure and results





1. Connect the circuit as shown in the diagram above and we get two resistors 4.7kΩ and 10kΩ.

2. By measuring the V0, we can get the voltage of LDR is 5-V0, and the current I is V0/R0, so we can get the resistor of LDR is (5-V0)/I. By using the following between illumination and resistance of LDR we can get the illuminance.



3. Using oscilloscope to visualize V0 and covering the LDR properly to have diffrrent light levels.

When the surrounding light is normal(R0 is 4.7kΩ), the V0 is about 2.22V. When light is dark , the V0 is about 0.57V. When light is bright, the V0 is about 4.19V.

4. If the ambient light intensity is stable, the amplitude of V 0 will hardly change, but if the ambient light intensity is suddenly changed, the amplitude of V 0 will change suddenly and at a very fast rate.

Code:

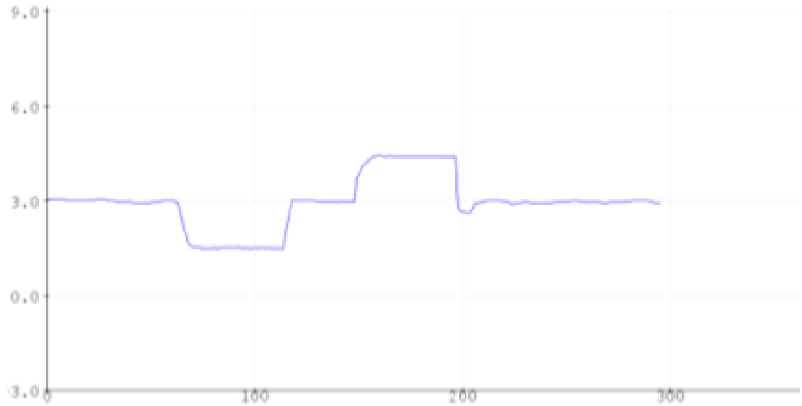
```
void setup(){
        Serial.begin(9600);
}
void loop(){
        float sensorValue = analogRead(A0);
        sensorValue = sensorValue*5/1024 ;
        Serial.println(sensorValue);
        Dealy(100);
}
```

Graph:

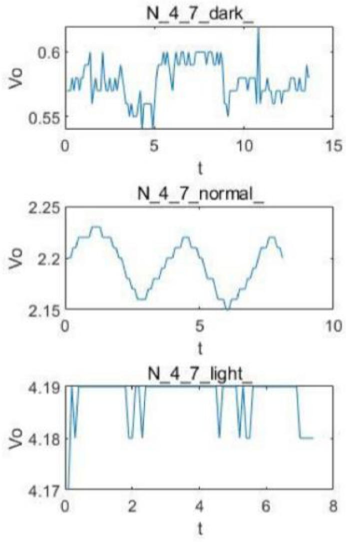
Opening the serial monitor to see the value of V0.

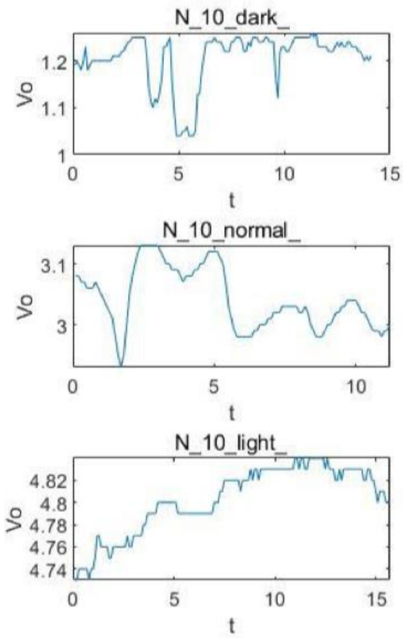
When R0 = 4.7kΩ

When R0 = 10kΩ



Using matlab to plot V0.





Using matlab to caculate the resistors of LDR:

	Dark	Normal	Bright
R_0=4.7KΩ	$3.6 \times 10^4 \Omega$	$6.4 \times 10^3 \Omega$	$9.1 \times 10^2\ \Omega$
R_0=10kΩ	$3.1 \times 10^4 \Omega$	$6.0 \times 10^3 \Omega$	$4.1 \times 10^2 \Omega$

Comment:

Taking the R0=4.7kΩ and the light is normal as an example, by refering the "Reistance VS. Illumination" we can get the illumination is about 15lux.

***Code*:**

```
Delay=0.1;
R=4700;
aVo=mean(N_4_7_normal);
I = aVo/R;
LDR = (5-aVo)/I;
```

Comment:

When R=10kΩ. By comparing the dates, we can get a result that as the value of R0 is bigger, the value of V0 and RLDR is small in the same surrounding light.

Part 4: A summary of what you gained in the lab.

Summary: In this experiment, we learned about the operating characteristics of the LDR and how to collect the voltage signal when the circuit is running through the Arduino and deduce the illuminance from the "Resistance VS. Illuminance," as well as the effect of different external resistor conditions on the operation of the LDR.

That's all, thank you for your patient examination !

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