HDU-ITMO Joint Institute
杭州电子科技大学 圣光机联合学院

INFORMATION SENSORS
LAB WORK REPORT
For Lab Work №1
“Introduction to Sensors. Optical Sensors I”

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Part 1. Introduction to Sensors.

I. The circuit

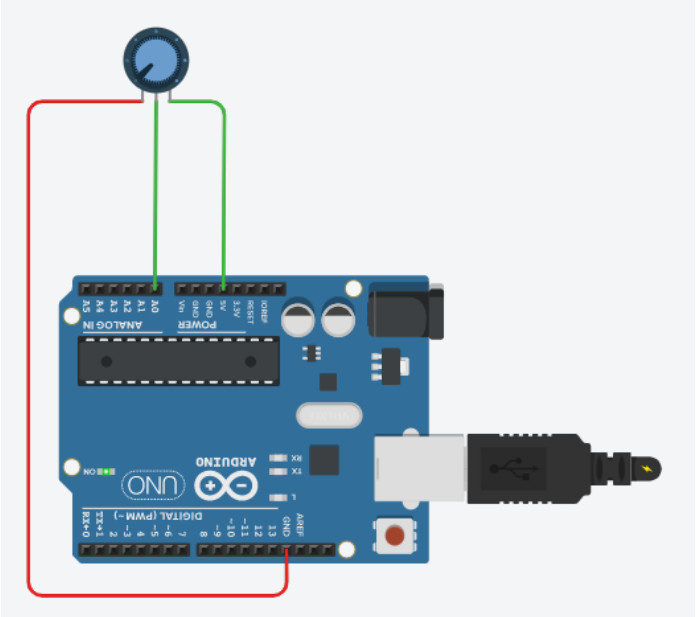

Figure 1.1. Potentiometer data acquisition circuit

II. The program code

```
// C++ code
//
int state = 0;
int potentiometer = 0;
int voltage_mV = 0;

void setup(){
  Serial.begin(9600);
}

void loop(){
  state = analogRead(potentiometer);
  voltage_mV = map(state, 0, 1023, 0, 5000);
  Serial.println(voltage_mV);
  delay(100);
}
```

Figure 1.2. Program code.

III. Table 1. Research data for Potentiometer

Experiment		Program	Error
Angular position, °	Voltage, mV	Angular position, °	
α	Vout	αp	E
0	0	0	0.00%
45	801	43	4.44%
90	1700	91	-1.11%
135	2497	134	0.74%
180	3299	177	1.67%
225	4198	226	-0.44%
270	5000	269	0.37%

IV. Sensor's characteristic plot

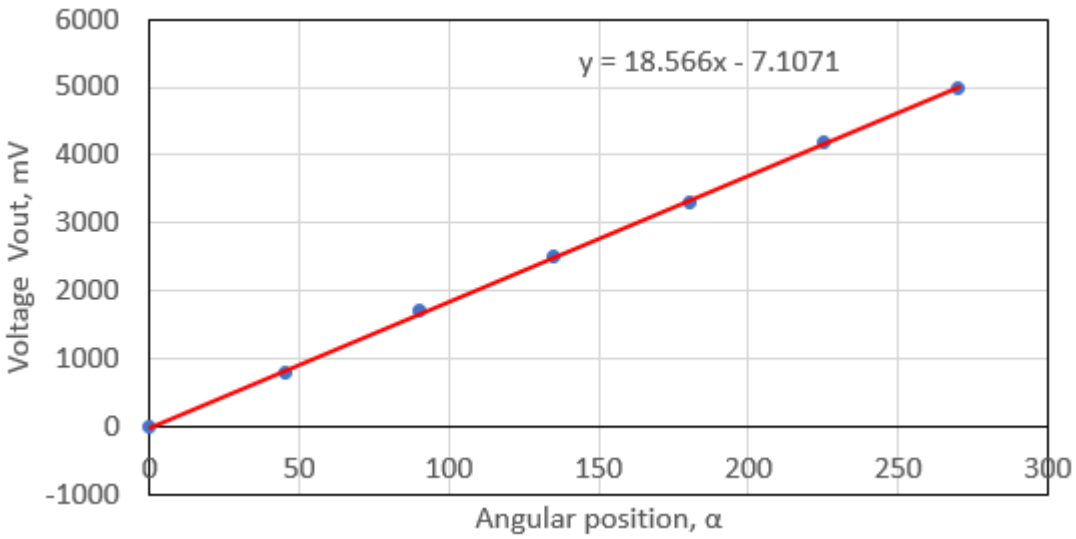

Figure 1.3. Sensor's linear characteristic with a trendline

V. Link to a TinkerCAD project:

https://www.tinkercad.com/things/dOnubsRqntv-375462?sharecode=VQ6taOMwYAXxY0O8EJyn-v52rLDaCCvm3kpQKPuAqXo

Part 2. Optical Sensors I.

I. The circuit

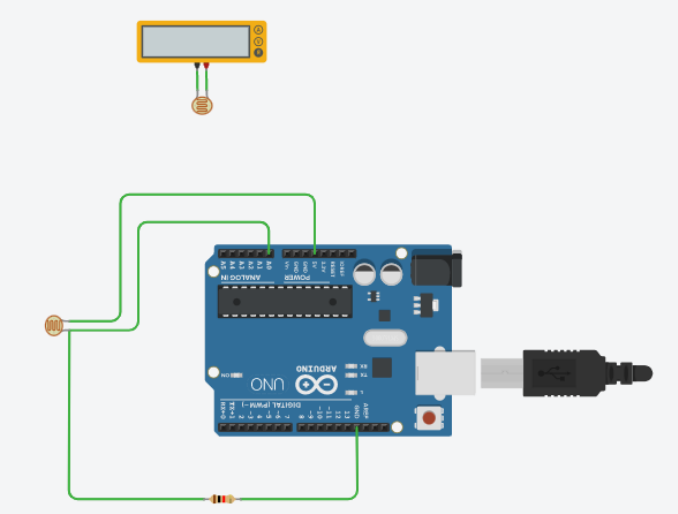

Figure 2.2. LDR data acquisition circuit

II. The program code

```
// C++ code
//
int ldrValue = 0;
int ldrPin = A0;
int voltage_mV = 0;

void setup(){
  Serial.begin(9600);
}

void loop(){
  ldrValue = analogRead(ldrPin);
  voltage_mV = map(ldrValue, 0, 1023, 0, 5000);
  Serial.println(voltage_mV);
  delay(100);
}
```

Figure 2.2. Program code.

III. Table 2. Research data for Photocell (LDR)

		Vout, mV	RLDR, Ohm	RLDRm, Ohm	Error, %	R2, Ohm	Vin, mV
Illumination, dark, Lm	0.1	29	171413.7931	180000	4.77%	1000	5000
Illumination, light, Lm	1000	3318	506.9318867	506	-0.18%		

IV. Calculations for light and dark resistance:

$$R_{LDR} = R_2 \cdot \left(\frac{V_{in}}{V_{out}} - 1 \right)$$

V. Sensor's characteristic plot

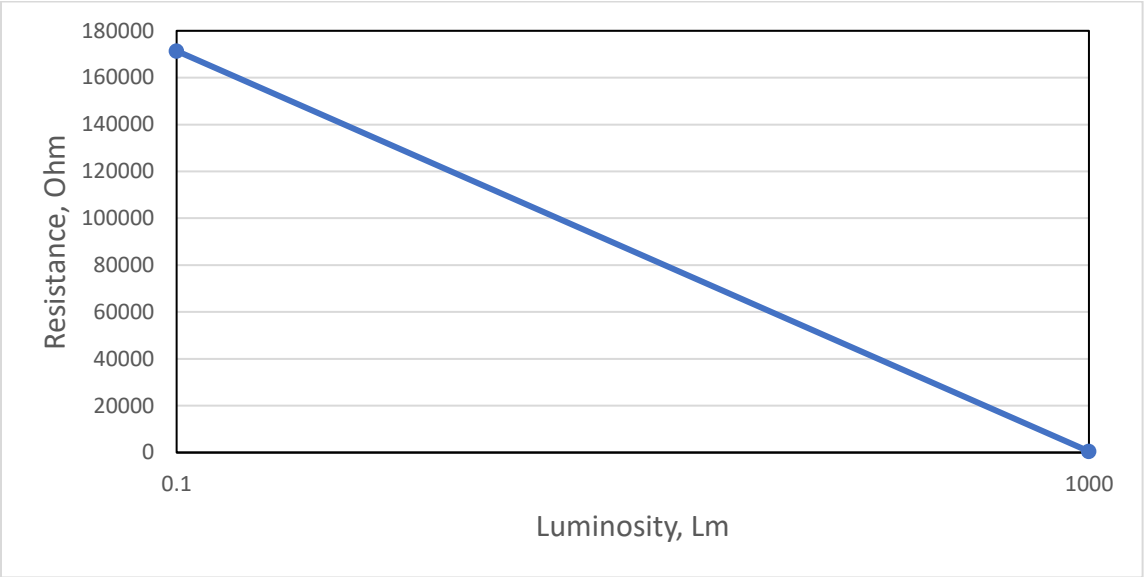

Figure 2.3. Resistance as a function of illumination

VI. Link to a TinkerCAD project:

https://www.tinkercad.com/things/dOnubsRqntv-375462?sharecode=VQ6taOMwYAXxY0O8EJyn-v52rLDaCCvm3kpQKPuAqXo