Week 7 Studio Activity

Start	Duration	Activity
0:00	30 mins	Activity briefing
0:30	60 mins	Activity part A
1:30	60 mins	Activity part B
2:30	-	End of session

Activity is to be done as individual students. Enter your workings in your Logbook.

Objectives:

- To analyze, build and test an analog sensor using a potential divider circuit.
- To build and test an analog sensor using a Wheatstone bridge.

Materials:

- Resistors ($10 \times 1\ k\Omega$, $10 \times 10\ k\Omega$), breadboard, wires
- LDR
- Digital multimeter
- DC power supply (5V)

Part A

We wish to build a light sensor to control lighting in a room. Consider the simple analog light sensor circuit shown in Fig. 1, where the sense resistor R_s is a light dependent resistor (LDR).
The datasheet for an LDR tells you how the resistance of the LDR varies with incident light. An example datasheet for an LDR is available for download, and provides information (reproduced here as Fig. 2 for convenience) on how the resistance of that LDR varies with incident light. **Note that the LDR provided to you may not be the**

Download datasheet for LDR SUNROM 3190 from https://www.sunrom.com/get/443700.

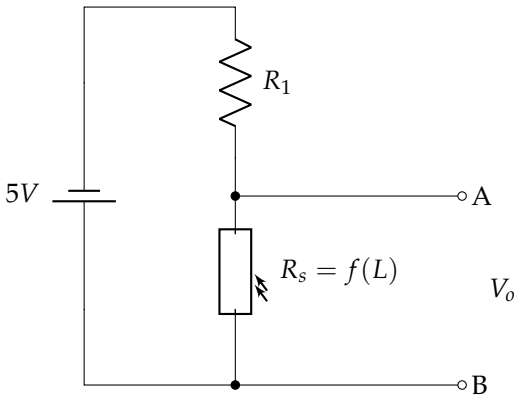

Figure 1: Simple electrical circuit to convert temperature T to voltage V_o that can be measured.

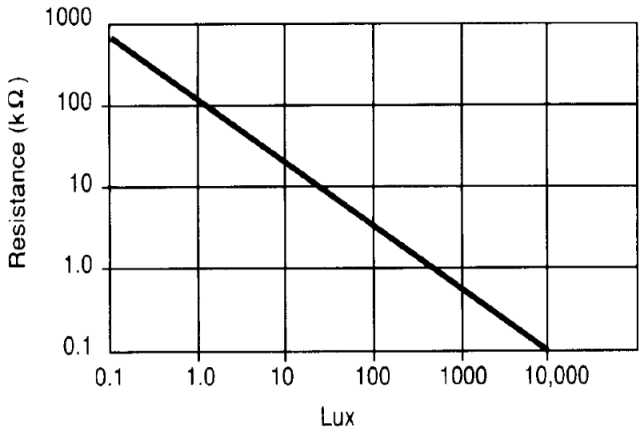

Figure 2: LDR resistance-illumination curve from datasheet.

same as the one in the datasheet, and so you will need to characterize the LDR through measurement.
Activity:

1. Measure the resistance of the LDR given to you in various lighting conditions (e.g. ambient light in your room, darkness by covering it, bright light shining on it, etc) to get a rough gauge for the LDR operation.
2. Recommend and justify a value for resistor R_1 to use in the circuit.
3. Construct the circuit on a breadboard.
4. Power up the circuit and measure voltage output V_o using a digital multimeter.
5. Change the amount of light on the LDR and see the output voltage vary.
6. Comment on the relationship between incident light and the voltage output.
7. How sensitive is your circuit to small changes in lighting? For example, if you simply bring a dark or white object close to the LDR, do you see significant changes in the output voltage?

Part B

In this part of the activity, we wish to build and test a light sensor circuit based on a Wheatstone bridge.

See reading material for this week to understand what a Wheatstone bridge is, and why you would want to use one.

1. Draw a schematic of the proposed light sensor circuit (using a Wheatstone bridge).
2. Recall from Part A the resistance of the LDR in various lighting conditions to get a rough gauge for the LDR operation.
3. Recommend and justify values of components (resistors) and voltage source to use in the proposed circuit.
4. Construct the circuit on a breadboard.
5. Power up the circuit and measure output on the digital multimeter.
6. Change the amount of light on the LDR and see the output voltage vary.
7. How sensitive is your circuit to small changes in lighting? For example, if you simply bring a dark or white object close to the LDR, do you see significant changes in the output voltage?

8. Comment on the advantages of a Wheatstone bridge sensor as compared to one using a potential divider.