Software Lab 9 *6.01 – Fall 2011*

Real Gain

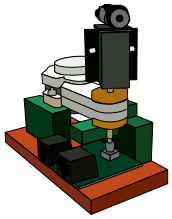
Goals: Using a real robot head, you build the light sensor circuit you designed in **Homework 3**, and characterize its performance, including its gain k_s.

Resources: This lab may be done with a partner (of your choice), or individually. You will need a **robot** and lab **laptop**, and in addition:

Proto board

Silver lamp

Red cable



Robot head

Robot

Two eight-pin connectors

Do `athrun 6.01 getFiles` to get the following file (in `Desktop/6.01/swLab09`):

- `eyeDataBrain2.py`: A brain which collects data on your light sensor circuit as a function of head angle.

1 Introduction

The main goal of this "software" lab is to measure the sensor gain k_s of the light sensor circuit you have designed for Homework 3.

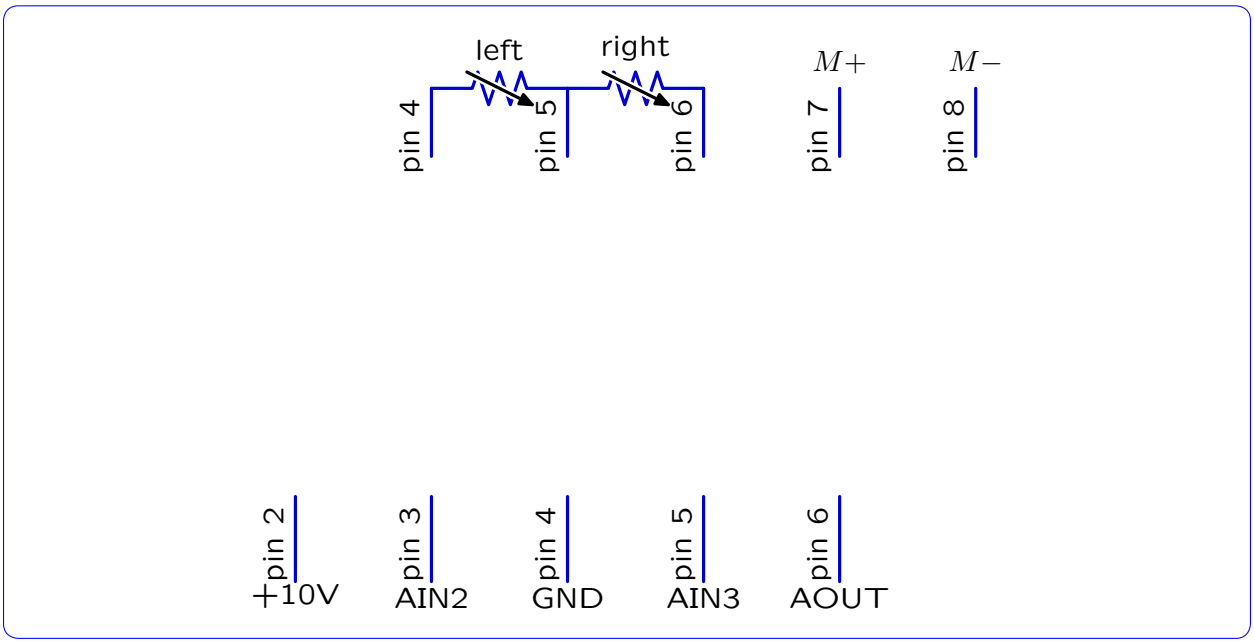
If you have not yet completed your light sensor circuit design, and Tutor problem Wk.8.4.1, do that first.

Once you have a circuit design, then do the following (either with a partner of your choice, or individually).

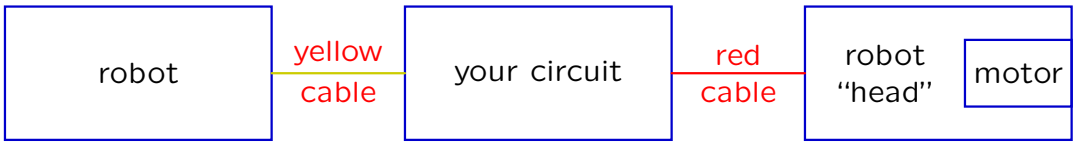
2 Light Sensor Gain

To estimate k_s we will need a plot of v_s as a function of angle to the light. We'll feed the voltage v_s generated by your sensor cicuit into an analog-to-digital input of the robot. Then v_s is measured by the robot as it turns 180°, while facing a fixed light source. The result is plotted in `soar`.

Step 1. Draw a diagram of your light sensor circuit in the box below, showing how it is connected to the **head connector**. Also show how you the use the **robot connector**, to provide power supply connections. And connect the output voltage v_s of your sensor to the `AIN2` analog input port of the robot. The motor pins may be left unconnected.



Step 2. It is convenient to mount the head on the robot. Connect the head to your circuit, and your circuit to the robot, just as you did in Design Lab 8:



Step 3. **Position the photoresistors so they are roughly 90° apart.**

Step 4. Connect the output of your light sensor circuit, v_s, to analog input #2 (pin 3) on the **robot** connector. This pin connects to an **A-to-D (analog to digital) converter** within the robot; for more information on how these work, see the *Infrastructure Guide*.

- Find one of the silver lamps and hold it near the robot at approximately one meter distance.
- Make sure the head/circuit is connected to the robot and turn the robot on.
- Start soar and select the `eyeDataBrain2.py` brain.
- Line up the robot in front of the lamp, so that the head is pointing at the lamp and the robot is about a meter from the lamp. Now manually turn the robot **clockwise** by 90 degrees.

- Click Start in soar. This will turn the robot through 180 degrees.
- Click Stop when the robot has fully turned.

One plot should appear when you click Stop: the v_s signal as a function of rotation angle (you need to figure out what the units are).

Step 5. Reload the brain file in soar and repeat this procedure holding the lamp farther away, say around two meters.

Step 6. Now, keeping in mind what k_s means in **Homework 3**, think about how you can estimate k_s from these plots, and give a good estimate. Does the value of k_s depend on distance?

Save your plots, labelled with the distances. Mail these results to your partner. We will discuss them at your next interview.

Checkoff 1. **Wk.9.1.1**: Explain your sensor design, and how you estimated k_s, to a staff member.

6.01SC Introduction to Electrical Engineering and Computer Science

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