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**RE:** Lab 05 Light sensing

The purpose of this lab was to integrate light sensing into Data’s behaviors. To do this we made 4 different behaviors: love, aggression, explorer, and fear. Each behavior reacted differently to the same light input. Light sensing behaviors were also integrated with obstacle avoidance to make a behavior that could still react to light without hitting anything.

In order to implement any light following behaviors first we had to calibrate the light sensors. Through testing we found that the value for the light sensor differed greatly depending if the light was hitting the sensor dead on or at an angle. These results are shown in Appendix A. Fortunately, it was always relatively linear and we were able to come up with an equation to relate the value obtained to a distance somewhat accurately.

The left and right sensors also had very different calibration equations. Although we could not figure out exactly why the equations were so different we compensated for these different calibration equations by handling each sensor differently in the code. This allowed for a much more accurate representation of the distance to a light source and only added an additional few lines of code.

Light sensing and obstacle avoidance were combined together using the potential fields method. The reciprocal of every sensor value is multiplied by some Kp depending on whether it is a light value or an obstacle value. Then these numbers are subtracted or added together into a left and right wheel value. This approach allowed us to easily implement many different behaviors and do so well within the constraints of the memory of the robot.

Appendix A:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Left Photoresistor** | | | **Right Photoresistor** | | |
| **Environment** | **Distance (inches)** | **-45 degrees** | **0 degrees** | **45 degrees** | **-45 degrees** | **0 degrees** | **45 degrees** |
| On table | 6 | 802 | 872 | 836 | 895 | 893 | 867 |
| On table | 12 | 755 | 783 | 775 | 850 | 860 | 801 |
| On table | 18 | 759 | 753 | 739 | 824 | 822 | 767 |
| On table | 24 | 738 | 707 | 682 | 771 | 757 | 728 |
| On table | 30 | 696 | 659 | 648 | 748 | 765 | 729 |
| Under table | 6 | 801 | 819 | 777 | 885 | 890 | 875 |
| Under table | 12 | 660 | 731 | 724 | 786 | 802 | 785 |
| Under table | 18 | 525 | 617 | 610 | 695 | 718 | 718 |
| Under table | 24 | 516 | 593 | 578 | 566 | 557 | 621 |
| Under table | 30 | 390 | 475 | 495 | 563 | 588 | 648 |

**Table 1:** table of photoresistor readouts for varied environments and locations.

**Figure 1:**  Calibration curves used for interpreting light sensor data.

Figure 2: Basic map of code structure

Choose behavior

Poll sensors

Compute motor speeds

Move