CPE 470-670 – Autonomous Mobile Robots

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Lab 5 – Handout

Coding Braitenberg Vehicles:
This lab will use light and contact sensors to develop programs for light seeking and light avoiding purposes, similar to the Braitenberg Vehicles we have discussed in class. The programs will be tested during the next lab.

1. Introduction to light sensors

- *Mounting the light sensors*: The location of sensors on your robot is very important when it is supposed to seek/avoid light. Try different locations and angles to see which is the suitable for best performance. Use the modified (3-pin) cables to connect your sensors to two analog ports of the HandyBoard.
- *Using light sensors*: Connect the light sensors to the HandyBoard and download the program on page 81 of your manual. Experiment with the response of the light sensors in different locations and orientations of the HandyBug. Record the following: 1) how the values of the light sensors are changing when the amount of light increases and 2) the range of sensor readings in the environment, going from the darkest to the brightest lit areas (you will later use these as the lower and upper limits of your sensor readings).
- *Normalize light readings to motor commands*: The analog inputs on your HandyBoard return values between 0 and 255. To transfer these values into motor commands, you should normalize the light sensor readings so that they belong to the range interval for motor power, which is between 0 and 100.

An example of light sensor reading normalization is presented in the book (pages 83-84). Instead of the MIN_LIGHT and MAX_LIGHT variables use the values you obtained in the first experiment. With this implementation, if there is not much light the robot hardly moves at all because its speed will be zero at ambient lighting conditions. Modify your program such that the robot still moves even if only perceiving ambient light.

2. Light seeking

Write a program based on the principles of Braitenberg Vehicles discussed in the class, which uses the light sensors to make your robot drive toward a source of light. You should use the principle of inhibitory connections, such that your robot will slow down in the presence of light and speed up when away from the light. Your robot should be capable of reaching the light source from various starting locations. Reference: Section 2.4 (pages 75-87).

3. Light avoidance

Write a similar program to the one above, but which makes the robot avoid the source of light, and turn away from it. Use the principle of excitatory connections, such that your robot will speed up in the presence of light and slow down when away from the light.

4. Light seeking and obstacle avoidance

Modify your practice programs from above, such that your robot should go towards the light while at the same time avoiding obstacles that might be in its way (back up and turn whenever bumps into an obstacle).

5. Wandering

Write a simple wandering program that makes your robot move around randomly until a certain criteria is met (for example, the amount of light detected by any of its light sensors gets above a certain threshold). Use the wandering program to seek light. Compare it with your previous program to see which one works better.