Assignment Array Sorter

NSF Workshop  Pam Lawhead
Overview

The purpose of this assignment is to give the student experience using Java arrays, light sensors and arrays to sort the sensor reading stored in an array. The text used for this class (Lambert and Osborne) provides code for sorting a simple one-dimensional array. This code may be used in this assignment. The only sensor required is a light sensor. You need to read Chapter 7 in your textbook very carefully to understand classes. Next, you need to answer the following questions BEFORE you come to lab.
Background

The array data structure is provided by the Java programming language to handle those situations where many similar items need to be read, manipulated, stored, written or dealt with by the computer in some way.

The actual assignment has an extensive background section
You have been chosen as the field tester for the Our Colors Don’t Fade in the Sun Paint company. The sun shines unrelentingly here in summertime Mississippi and you have decided that it is entirely too hot for you to go out each day and take the readings from each color sample to determine if there has been any change. The goal is to keep the colors stored in the company’s primary computer from lightest to darkest. To do this you must write a program that allows a robot to travel across a field of sample paint colors, take a reading of each using the light sensor, and then store that value in an array of colors. Once the colors have been collected, you need the robot to return those values to the main computer where they will be stored and sorted for future use. Your company is a start-up company so it is not making many different colors of paint at this time. In this case, “summer paint sun test” there are only 5 colors that are being tested. As profits increase, the company will add additional colors to it’s a palette but, for now, 5 will do.
Lab Preparation

1. What is the Java syntax for declaring an array?
2. What new leJos classes will you need to complete this assignment?
3. What are constructors used for? How are they defined?
4. What is the simplest way that you can sort a list of numbers?
5. What are the classes that have you already written that can be reused here?
6. Will you need two arrays to sort the numbers? How will you handle that?
Laboratory

Robot needed: RCX brick, two motors, 4 (or 2) wheels and one light sensor

**LeJ os classes and methods needed:**

- **Motor:** setPower(int aPower), forward(), backward(), stop(), flt()
- **Sensor:** activate(), passvate(), int readPercentage() (for light sensor)
- **LCD:** showNumber(int value), RCXComm
Solution Strategy

(Note: You might need to write a little test program to determine the light sensor percentage for the different colors.)

You need to be sure that the paint colors are distinct enough that the different colors can be recognized by the sensor. You might need to put a black line between the colors.

You need to first identify the different parts of your program - objects, attributes and methods.

Decide what variables that you will need. What methods will be required to access these variables?

Using the description of a class template found in your book on p. 160 define each of the four parts of your robot class template.
Solution Strategy (continued)

- Write each of the methods that you have identified in step one.
- How will you get your robot to return values to the PC? What class will you use?
- What methods in that class will be required? What are the arguments required?
- Hint: You might have a problem with the robot running too fast to get accurate readings of each of the colors, what are some solutions to that problem?
Testing

1. What is the first thing that you need to test?
2. What should the output from this program look like?
3. What is the input?
4. What would be an example of the program not working?
5. What would you do to fix the problem identified in question 4?
6. What are the expected inputs and outputs of each module?
7. What would it mean for a value to be out of bounds for each module?
8. What are two different ways that an array could be out of bounds?