Foundations of Computer Science  
Robotics Lab 3  
Tasks, functions and multitasking

There are two problems for today’s lab. Do as much of this lab as you are able in the time available. You will get full credit if you fully complete one problem. If you complete both, you’ll receive bonus credit.

1. Read Chapter V, “Tasks and Functions”. Skip the section on semaphores (the last section) since we won’t try to employ them in this lab. Carefully read the program that moves the robot in squares while checking for collisions and be sure you understand both functions and tasks.

   Be careful about the misprint on p 21 in the 1999 printing of the lab module. The first line of the function on p 21 should read

   ```c
   void turn_around(){… not function turn_around(){ …
   ```

2. Now, use multiple tasks to solve the following problem. Use two light sensors to guide your robot around the track so that it straddles the track rather than hugs an edge as we did in last week’s lab. One sensor should check the left side and the other should check the right side of the track. Each sensor must be controlled by a separate task which makes the corresponding sensor veer away from black so that the robot seems to be bouncing off the two sides of the track. See the instructor’s demo. Test the program on the “Grand Prix” racetrack outside in the corridor (be sure to check light level readings on that track). When the program is able to move the robot at least as far as the cloverleaf near the finish line, notify the instructor and give him a printout of your code. If the robot moves correctly and the code uses tasks as directed, get your “checkoff.” You may get partial credit if you get as far as the lettering that appears in the middle of the track.

3. Read Chapter VI, “Making sounds”. Write two functions, one that plays a short but “sad” tune and another that plays a “happy” tune (your instructor will show you how to use the Bricx Piano to make this easier). Then build a robot that wanders around the room and whenever it bumps into something, stops its motors, plays its sad song and then restarts and moves away from the thing it bumped into. When it bumps for the 4th time, it should play a the happy tune and shut off. You’ll need to use the concepts of tasks and functions from Chapter V and music from chapter VI. It is strongly suggested that you solve this problem before starting to write the code. Sketch out your ideas and then write the code. When it works correctly show the instructor and give him a copy of the printout of the code. If the robot moves correctly and the code calls the tunes as functions as directed, get your “checkoff.”

Clean up your stuff and turn in this sheet.

Checkoffs