

91.451 Robotics II  
Spring 2004  
Prof. Yanco

### Take-home Exam

Out: Thursday, 1 April 2004

Due: Tuesday, 6 April 2004 by start of class

This exam is open book and open notes. You may take as much time as you like on the exam, although it should take more than a couple of hours. Complete this exam by yourself, without discussing any questions with your fellow students. Sign the line below to certify that you did not discuss the exam with fellow students nor did you get answers from anyone. (Turn this page in with your answers.)

Signature: \_\_\_\_\_

You may type your answers if you wish. For Pyro questions, you may test your code on the robots or in simulation. (For those of you who share lab benches, work a schedule out with your partner to use the computer.) Do not leave files on your computer or on the robot in a shared account.

*Problem 1 (15 pts):* Describe the difference between horizontal and vertical behaviors. Give an example of each.

*Problem 2 (15 pts):* List and describe two methods of blending behaviors.

*Problem 3 (10 pts):* What problems can arise with sonar sensors?

*Problem 4 (30 pts):* Write Pyro code to make a robot (real or simulated) transcribe a triangle. No obstacle avoidance is necessary. You may select your preferred control method.

*Problem 5 (30 pts):* Write behavior based control code using fuzzy rules to search for open space in front of the robot and move towards it. You do not need to worry about obstacle avoidance or backing up. Have your robot stop if all front sensors read closer than 1 robot length.

*Bonus: Uber-wall follow.* Write the ultimate wall following program, using any paradigm you choose. The program that can traverse the longest length of hallway wall before losing or hitting the wall will be given 10 extra points on the exam. Anyone submitting code for the bonus problem will receive 5 extra points on the exam. Wall following trials will be held at the start of class on Tuesday 6 April. You will have two chances to start from a specified starting point to try to get the longest distance.