

CS 491/691X – Topics: Introduction to Robotics

Instructor: Monica Nicolescu

Assignment #2

1) Write a lab report for Lab #3 (one report per team): Your report should describe the following issues:

- Your software design
- The problems that you encountered during the implementation (hardware, software)
- Your solution to the above problems
- Any unsolved problems and reasons for why you were not able to solve them

Reports should be typed and should be formatted as follows:

- a title page with the names of all the students in the team, the team number and the lab report number
- each report page should be numbered and labeled with the team number
- the pages should be stapled together

Add to the report any additional information that you think could improve your robot evaluation. Submit your report at the beginning of Lab 4 (on Feb 12).

2) Submit the programs you developed for the Tunnel Escape contest by midnight on Friday, Feb. 6.

3) Programming assignment: Extend the Tunnel Escape program you wrote for Lab 3 so that you can meet the challenge for the Corner Escape Contest. **Note:** This part of the assignment will not be graded, but completing it properly will have a great influence on the results of your robot in Lab's 3 Corner Escape Contest.

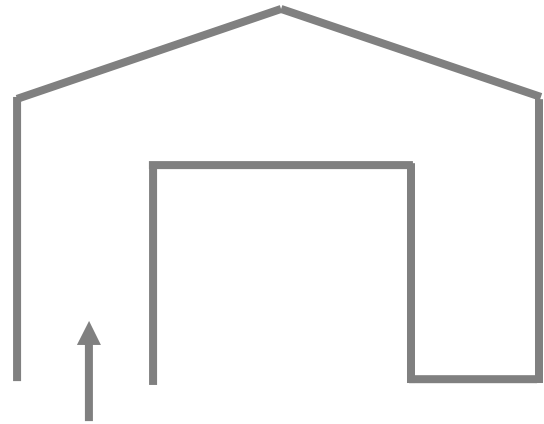
Corner Escape Contest:

For this assignment you will rely on the obstacle avoidance capabilities you developed in the previous lab. In the **corner escape** contest, you are supposed to write a program for your robot to go through a tunnel with a dead end and come out of it from where it started and not get stuck in it.

Contest Rules:

- In this contest, there is again no winner or loser. Every group's robot should come out of the tunnel in a reasonable amount of time.
- Your robot should back up whenever it bumps to a wall (obstacle avoidance).
- After backing up, it should turn in an angle not greater than 45 degrees.

- Your robot should make a RANDOM turn when the number of consecutive bumps in a 4 seconds range of time exceeds 4. You may adapt these values by experimenting with your robot in a “stuck” situation.
- The turning angle for the random turn should be more than 45 degrees. The upper limit of this angle is up to you.
- You should minimize the number of bumps to the opposite wall after your robot backs up from a particular wall.
- Keep in mind that the angle in which your robot will start going through the tunnel is not known to you prior to the contest. Your robot should perform satisfactorily regardless of this angle.
- Every time your robot reverses its direction in the tunnel, you will get negative points.
- The tunnel shape is like in the figure:



Programming tips:

- a) Use the concept of Meta-Sensing in your program. Meta-Sensing is basically the ability of your robot to monitor its own performance and decide to solve the problem that it senses. For example, when it reaches the dead-end, it can sense it (e.g., the robot bumped more than 4 times in 2 seconds) and decide to do a random turn to get out of the trouble.
- b) You can get ideas for your program from the Randomness concept (pages 87-89) and Meta-Sensing (pages 89-94).
- c) Try to implement a way in your program to show when it's doing the random turn. For example you can use the LCD screen to print a message on it or use the beeper.