# EE346 - Mobile Robot Navigation and Control

Winter 2021
Capstone Laboratory (25%)
Date: Saturday May 29 (9 AM) and Sunday May 30 (9 AM) if necessary
Term Competition

In the final lab, we will run a competition-based experiment in which the various functions of navigation and visual recognition you have learned throughout the semester will be integrated into a complete system.
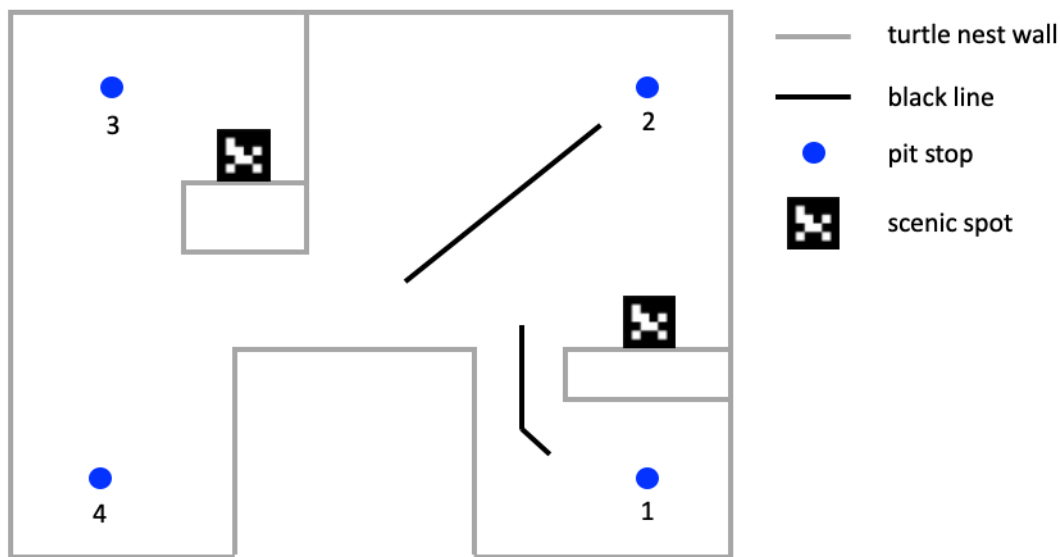
The experiment will be conducted in the walled environment shown above that has been set up in the lab.   Four blue circles represent locations (pit stops or PS's) where the robot needs to make a stop. Each pit stop is exactly 50cm from the two adjacent walls. A successful stop requires your robot to touch the circle with any part of its body.   There are also two black lines that lead your robot through (1) the narror channel from the room of PS1 to the room of PS2, and (2) the interior area of the largest room of the environment where LiDAR data may not be reliable for localization. These black lines are provided for the purpose of assisting your robot to move from one room to another, and you do not need to use them. Finally, there are AR code markers (scenic spots or SS's) placed somewhere on two walls and their numbers are not known a priori.   The SS recogntion task requires your robot to detect the AR code and make an audial signal that describes the AR code.

The competition will consist of two rounds. The first round, which is worth 50% of the marks, will be completion based.   Your robot should start from PS1 and visit SP2, SP3, and SP4 in turn, as well as searching for the two SS's and reporting/signaling their numbers when they are found.

Each of the five tasks (three PS's and two SS's) is worth 10% (SP1 is the initial locatioon and not worth any points).   If your robot is able to stop near a SS but fails to touch the SS, a dedution of 3% will be made. Also your robot cannot touch the wall at any time. Each touch of a wall results in a reduction of 1%. Recognition of the SS's must be performed without external assistance (e.g., placing a black background behind the marker). Each robot will have two chances at this round, and the top marks of the two will be your final mark for this round.

The second round, which is also worth 50%, will be competition based.   Your robot will have a total of three minutes to compete.   Also starting at PS1, it can attempt any of the SP's and/or SS's in turn, to earn points. You can attempt SP's only or SS's only, but your robot must alternate tasks between the left half and the right half of the turtle nest, e.g., SP2 followed by SP3 or SS1 followed by SS2.   As well, your robot can attempt a SS followed by any SP, and vise versa. Deduction of points will be made in the same way as in the first round, when your robot is not able to reach a PS or if your robot touches a wall . You will have two chances in this round, and your final mark will be based on the placement of your robot around the nine teams in the class.   You must be able to complete at least two tasks of the five tasks to qualify for a placement.   For round two, the first place team will earn 50%, second place 47%, etc., in decrement of 3%.

Notes:

1. Rules above are preliminary and subject to further clarfication.
2. Your total mark for this lab will be the sum of the two rounds.