General Guidelines & Requirements

Each group will have to complete ALL assignments as required. From here on, your grade will be comprised of these lab assignments. You and your group are strongly encouraged to work outside of our regular lab hours. The 2-hour lab that you have WILL NOT be enough for the assignment preparation. When you come to the lab for check off, we expect that your entire team is present and that your robot is working according to the requirements.

If your robot is working properly, you will be graded on its performance, based on a letter grade. The judges evaluating your project will be your TA and your class instructor (Prof. Shafai). If it is not working for some reason, either because some part failed or because you couldn't finish the assignment, we will check your code and the actual robot and based on that, we will assign a grade. By default, you will not be able to receive full credit if your robot is not working as required. Also, note that all your robots must be totally autonomous and work by themselves without any output controls from computer, joysticks, etc.

You might find it useful to first make a well-built robot, and then make modifications to it for the different assignments. If you begin with a well-built robot, it will be much easier to add a couple of sensors and buttons, rather than rebuild it. You can use any part of code you find useful from the book or from any other resource. However, you might be required to give the judges a brief explanation of how your code works. Parts such as sensors, faster motors, buttons etc. can be purchased from RadioShack or digikey.com or parallax.com. You are encouraged to buy a robot kit on your own in order to speed up the process of building a robot. Finally, standard parts such as resistors or capacitors are available at the equipment room.

Assignment 1 – Wall Following Robot

Build a robot that can follow a wall. You can use any means to sense the wall. This includes, but is not limited to, switches, buttons, IR sensors, photodiodes etc. You choose what you need to use. That means that you might have to try a couple of different techniques before you find the one that is optimal. You will be judged on speed, efficiency, and creativity. Be prepared to have your robot follow any track. This means that you will not know beforehand how the path will look like. The ideal robot should be able to follow the wall parallelly without touching it. The assignment is due on March 17th, 2017.

Assignment 2 – Line Following Robot

Your robot is required to navigate a fairly complicated track of black duct tape. This cannot be done with mechanical switches. You will need to build some kind of sensor circuit to measure the reflectance of the tape. In the past, students have used IR emitter-detector pairs and they have worked very well. Extra credit will be given to robots that maneuver quickly and finish the track fastest. The assignment is due on March 24th, 2017.

Final Assignment – Parallel Parking Competition

In this assignment, you are supposed to build a robot capable of fast parallel parking. Your robot should be able to park between two rectangular boxes. Note that you will need a sensor to detect the boxes that could be of any color. However, their color will be different from the wall behind them or they may be located in the middle of the room. Your robot should avoid any collision of any kind with any of the boxes or the inside wall. It should also be parallel and fairly near (under one inch distance) to the inside wall when it is parked. Ideal robot is fast and robust in the tightest gap. The gap between the boxes will be about 10% wider than your robot total length but you can earn extra credit with parking in tighter gaps.

For the demo day, you just have one timed-lap (attempt). The clock start running as soon as your robot head pass the starting line. It then should go forward till it reaches the gaps between the boxes, park itself as fast as possible, left the parking spot and continue till it pass the end line. Whenever the tail of your robots passed the finish line the clock will stop. Then you will get a point based on your time, park accuracy and collisions. Note that you can not park your robot sideway. The parallel park of your robot should exactly mimic the parallel park of a car. This project is fairly complicated and will require a significant amount of time. You can use any combination of sensors or any other component that you may need. Bells and whistles, such as beeping or flashing lights, are always welcome for extra credit. The assignment is due on April 7th, 2017.