Final Project

Draft Proposal
due in lab, the week of Wednesday, March 24

Now that the midterm contest is over with, it's time to start thinking about a final project. The final project starts after Spring Recess and ends in the Talent Show, just before the final exam period. Participation in the Talent Show is compulsory and you will be graded (among other things) on your performance in it.

The Final Project Proposal

The first step is to propose a final project. The proposal should be a relatively short (3 to 5 pages) document detailing the project that you would like to attempt, the challenges and problems that you plan to encounter along the way, some thoughts on how you intend to approach solving these problems. The idea of writing the proposal is to let us evaluate your project plans and adjust them if we think that they are too ambitious, or not ambitious enough.

The proposal should outline the general idea of the project in enough detail that we know what you're thinking of. For example, "the robot will try to find stuff" is too vague, but "the robot will try to find painted golf balls, using filtered light sensors" is about right. Similarly, talk about what sort of approach that you plan to use. "the robot will learn to avoid things" is bad, but "the robot will use Q-learning and bump sensors to learn to avoid obstacles" is good. Be specific, but not down to the level of using pseudocode. You should define specific milestones (see the next section) in order to let us make sure that you're making progress towards finishing the project.

The proposal only carries a small grade, but if it's too vague, or undecipherable, then you'll be asked to write it again (and hand it in before Spring Recess). You can't start a final project without an approved proposal.

We'll review the proposals over break. When you come back, you should meet with your TA during your scheduled lab time to go over the (possibly revised) proposal and to make any arrangements that you need to begin the project.

Milestones

There are three official final project milestones listed in the syllabus. For each of these, you should have some concrete deliverable that you bring to your lab section and show your TA. The purpose of these is to make sure that you are making suitable progress towards finishing the project, and also to make sure that if you don't quite finish it, then you at least have something to show off in the Talent Show.

You should also make an extra milestone beyond what you expect to accomplish. If everything goes well and you manage to finish what you set out to do before the end of the project, you can get extra credit for implementing something even more cool that you originally intended to.

As an example of the sort of thing that we're after, consider a robot that finds colored golf balls using filtered light sensors and a big lamp mounted on the robot.

Milestone 1:	Redesign the robot base and mount the lamp on it. Make sure that the light sensors can detect the colored balls and tell the difference between the colors. Implement the basic ball-trapping behaviors.
Milestone 2:	Implement the ball-finding routines without obstacles in the way. The robot should be able to find and capture any balls within the enclosure at this point.
Milestone 3:	Implement the ball-finding routines in combination with obstacle avoidance. The robot should be able to cope with random non-ball obstacles in the enclosure.
Extra credit:	Make the robot only collect red balls and leave the green ones where they are. Alternatively collect both, but deposit them in different places.

The important thing to note is that at each milestone you have something concrete to show. You should design the project so that it is incremental, with each milestone building on the previous one. Count of getting to milestone 3.

Extra Sensors and Hardware

If you think that you need extra sensors, then talk to your TA about what we have. A brief list includes:

- bump sensors
- light sensors
- active IR sensors (two types)
- shaft encoders
- tilt switches (mechanical and mercury)
- bend sensors

There may be others. If you have any specific ideas or questions, talk to your TA. We also have additional motors that you can use (you can hook up 4 to the board easily, 6 at a push), and a cool Lego hydraulic arrangement if anyone it interested.

You're free to build and add in your own hardware, but this can't be the focus of the project. Any hardware that would be critical to the project's success **must** be successfully demoed to a TA as part of the project proposal, ideally before break.

The Final Project Report

The final project report should be a reasonably complete document, detailing what you set out to do, the problems that you encountered, how you overcame them, how successful you were, what the final state of the project is and how you would extend it if you had the time. Previous papers have generally been around 10 pages or so.

Think research paper. Someone should be able to read the paper, understand what you did, know your reasons for doing it and be able to reproduce your results. This means that there should be plenty of explanations, diagrams and reasons why you did what you did. Remember you should analyze the behavior you achieve, not just describe it.

The paper should be typeset and spell-checked. **Each person,** must write their own final paper. Each paper should say what the team did, but also highlight any individual work done (for example, if a certain algorithm was mostly one person's work, that should be explicitly noted) The paper is due at midnight on the day of the Talent Show, to allow you to add in any last-minute insights gained from the show.

Grades

The final project accounts for 30% of your final grade for the course. This breaks down to 20% for completing what you set out to do, completing your milestones and successfully participating in the Talent Show, broken down as follows:

10%	Proposal
20%	Milestone 1
20%	Milestone 2
20%	Milestone 3
30%	Talent Show and extra credit

The remaining 10% is for the project report. You should remember that even if you didn't complete what you set out to do, you can still write it up and get credit for it, as long as you analyze what went wrong appropriately.

Graduate Credit

Graduate students can get graduate credit for the course by completing a more challenging final project. If you want to do this, then talk to your TA about what "more challenging" might mean for you.

Questions?

If you have any questions about any of this, get in touch with Bill, or either of the TAs.