

March Madness Redux

EE/CS118 Winter 2002

Project Presentations on March 11, 2001 starting at 7:00 PM, Location TBD

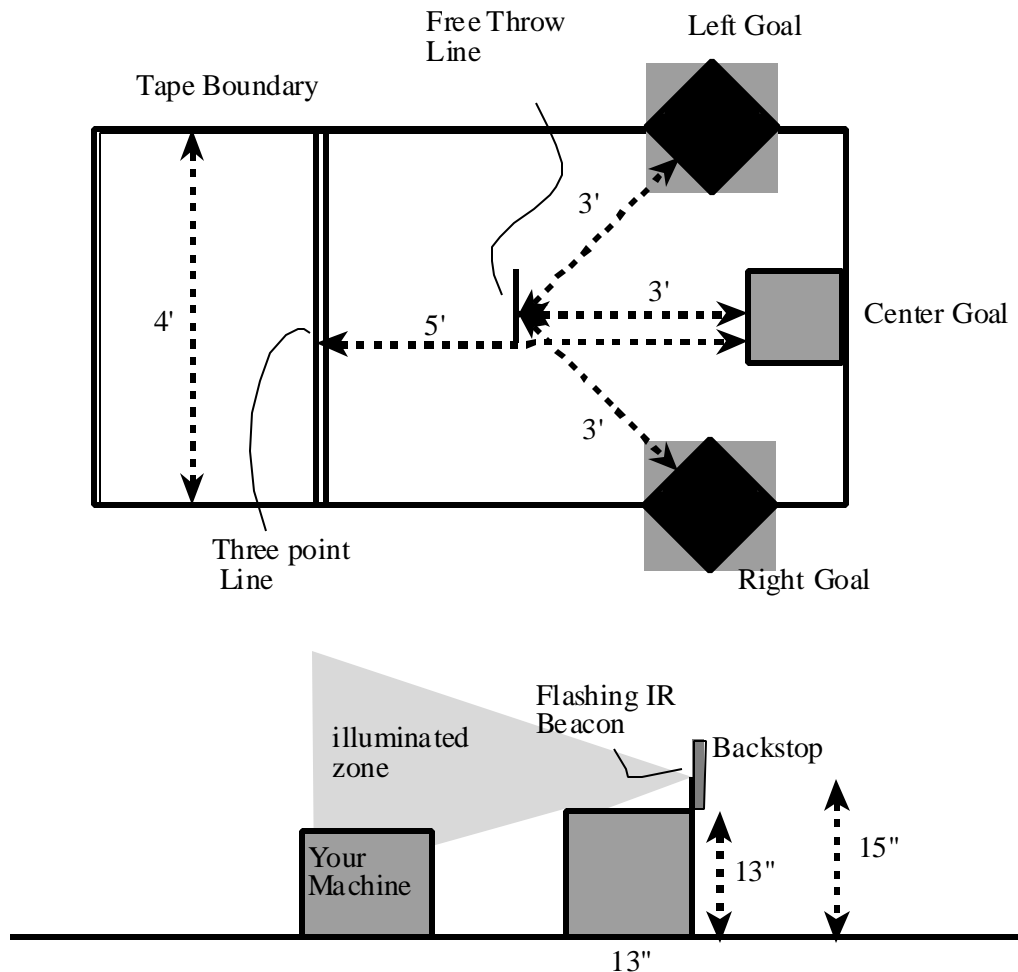
Purpose:

The purpose of this project is to provide an opportunity to apply all that you have learned to solve an open-ended problem. The task is to design an autonomous machine to deliver small foam balls to each of three baskets within a finite time.

Specifications

The Field

The "Court" consists of a 4'x8' rectangular space marked on the felt-covered playing board with black, non-reflective tape. Within this court, there is a double black tape line 5' away from the front of the center basket, labeled the "Three Point Line". There is also a single black tape line 3' away from the front of the center basket, labeled the "Free Throw Line". All three baskets are 3' from the center of the free throw line. There is a 3" high wooden railing surrounding the court on all sides



Each basket is 13"x13"x13", and consists of a milk crate positioned so the top is open. A flashing infrared beacon is positioned behind each crate, mounted a height of 15" from the floor, and centered behind the crate as viewed from the free throw line. These beacons illuminate an angle of +/- 20 degrees above and below horizontal, and will be visible from any place in front of the baskets. A semicircular backstop (radius 6.5") is mounted above the back edge of the basket. Black, non-reflective tape will be placed on the floor surrounding the baskets 3" outside the edge of the baskets.

The Droids

The machine must be a stand-alone entity, capable of meeting all specifications while connected only to power and ground. For setup purposes, a computer will be available to download your operational code. Once the download is complete, the computer will be disconnected. To make use of this feature, you must be prepared to provide the file to be downloaded on a 3-1/2" floppy disk.

- Your machine is required to occupy a volume not to exceed 13"x13" in horizontal dimensions and 12" in height when initiated. Your machine must contain the complete supply of foam balls to be used during the event. At least three are required, but there is no upper limit, except that imposed by the total volume of the machine.
- Each Droid must be constructed as part of EE/CS118. It may not be based on a commercial or otherwise pre-existing platform.
- Each Droid will have an easily accessible power switch.

The Game

- Your machine will be placed at the free throw line in a random angular orientation at the start of the game. The beacon behind the center basket will be the only illuminated beacon. Once a ball is delivered to the center basket, the center beacon will be turned off, and the beacon on the left or the right will be illuminated. Your machine is then required to deliver a ball to the newly-illuminated basket. Once successful, the beacon will be turned off, and the remaining basket will be illuminated. Your machine is then required to deliver a ball to the remaining basket. All of this must be completed within 2 minutes. If your machine delivers balls to the 3 baskets, the lights will continue to switch until 2 minutes have expired, allowing your machine to score bonus points.
- Balls launched from a 15"x15" area behind the Free Throw Line are worth a single point, Balls delivered or launched from any location inside the 3-Point Line, but not at the Free-Throw Line are worth 2 points. Balls launched from behind the 3-Point Line are worth 3 points. Scoring does not affect grading, but will be used as the basis of a competition at the Public Presentation.
- Once the machine has been activated, the operator may not touch the machine until the entire sequence is complete. During operation, the machine is required to stay within the taped boundaries of the court. If the machine makes contact with a basket, it is required to back away at least 3" before continuing with any other activities.
- Contact between the Droid and the perimeter wall is permitted.

Safety

The machines should be safe, to the user, the lab and the spectators. For this project, high-velocity delivery is not going to result in successful delivery, and must be avoided.

- Droids may alter the Space-Time continuum only during the public presentations.

Report

A report describing the technical details of the machine will be required. The report should be of sufficient detail that a person skilled at the level of EE/CS118 could understand, reproduce and modify the design. These reports will become entries into a design database that will be made available to future classes of EE/CS118. The report will be delivered in two parts:

- On February 26, 2002, you will turn in a set of schematics, textual descriptions and software design documentation that describes the state of the design *at that point in time*. It need not be tested, nor even correct. It must be turned in as soft copy.
- On March 15, 2002 the final report is due. This should be a document whose structure is complementary to what was turned in on February 26. This document should describe the final mechanical design, circuits and software implemented. It should specifically address how these final designs differ from the original design. The intent is to capture some of the lessons learned in moving from the original design to the final design. This report must include a soft copy of the entire report in HTML.

Evaluation

Performance Testing Procedures

One or more of the team members will operate the Droids during the performance evaluation. A competition among the class's Droids will take place after the performance evaluation.

Performance Evaluation. Performance evaluation will take place immediately prior to the public presentation. During the **Grading Session** each machine will have up to 2 minutes to deliver one ball into each of the baskets as they are illuminated by beacons. Grading is not based on point value, but is simply a measure of successful delivery. Evaluation for grading purposes will occur only during these sessions.

The Competition. After all of the machines have completed the performance evaluation, a tournament will be held. Performance during the tournament has no impact on your grade.

Grading criterion

Each group will receive 5 grades for this project.

1) Concept (20%) This will be based on the technical merit of the design and coding for the machine. Included in this grade will be evaluation of the appropriateness of the solution, as well as innovative hardware, software and use of physical principles in the solution.

2) Implementation (20%) This will be based on the prototype displayed at the evaluation session. Included in this grade will be evaluation of the physical appearance of the prototype and quality of construction. We will not presume to judge true esthetics, but will concentrate on craftsmanship and finished appearance.

3) Report (10%) This will be based on an evaluation of the written report. It will be judged on clarity of explanations, completeness and appropriateness of the documentation.

4) Performance (20%) Based on the results of the performance testing during the Project Preview.

5) Coaches Review (30%) Based on the three project milestone reviews.

Note : This is a Mechatronics Project Design Activity. Grading in this class is based on complete system design and function. Therefore, a "beautiful" mechanical or electronic sub-system or elegant code is not a successful project if any of the other parts of the machine fail. Be sure to allocate resources (time and people) to all aspects of this project.

Project Milestones

Deliverables

First Review
2/19/02

At least 5 concepts, with sketches, Time schedules, Personnel Assignments.
Presented in Class (Using overhead projector)

Second Review
2/26/02

Calculations, System Block Diagram, Prelim. Test Results
Presented to Coach

Third Review
3/7/02

Working versions of all systems, Working software to test all systems, Integration of systems.
Presented to Coach

Final Presentations
3/11/02

Finished, operational machines