CSE 4360 / 5364 - *Autonomous Robots*

Project 3- Fall 2023

Due Date: Dec 14 2023 - Demonstration Time Slots will start on Dec 11

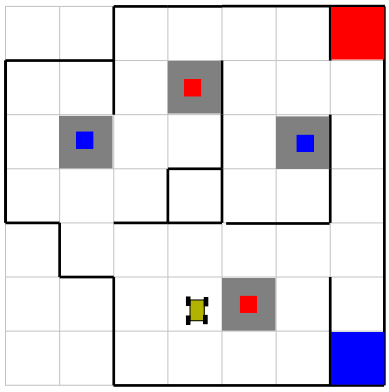
The final robot projects will use the same Lego EV3 robot. For the final project, groups have a choice among several different projects. If you would like to modify the project or propose your own you need to have the modified project approved by the instructor first.

Clean-Up Robot

The goal of this project is to design a robot that can move through a room environment similar to the one used for the second project (again, its layout is unknown beforehand) and clean up a number of colored blocks into the appropriate locations.

For this task, a number of blocks (approximately 5cm x 5cm x 5cm in size) of two different colors (red and blue) will be distributed in random locations in a room environment. Blocks will be initially on top (and in the center) of a colored floor tile. In addition, there will be two corners in the environment that are color coded (red and blue) that serve as the deposit areas (and for which the locations are known beforehand). The task of the robot is to find the blocks and to bring them to the matching corner and leave them there.

The following figure shows an example environment:

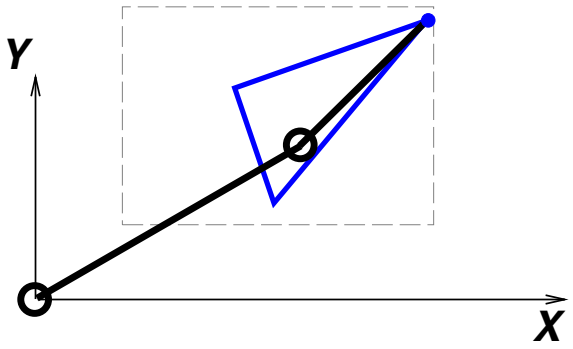


Drawing Robot

The goal of this project is to build and program a robot arm that can draw polygons using a marker. Here you should build a robot arm that can move a marker mounted at its end across a piece of paper to draw arbitrary polygons given to it (at compile time). Given that polygon, the robot should move the marker to the first corner (without drawing a line) and then trace the shape on the

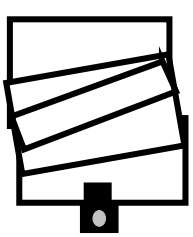
paper. Drawing will be limited to a 15cm x 10cm area that can be located based on the kinematic characteristics of the robot constructed.

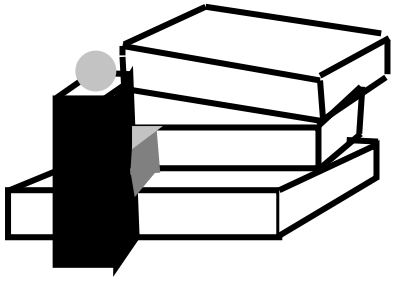
The following shows an example scenario:



Stair Climbing Robot

The goal of this project is to build and program a robot that can climb up and down a set of stairs with 10cm steps. The depth of a step can be variable but its height will be fixed. In addition steps can be winding upward (i.e. each step can be at an angle with respect to the previous one). The ends of each step will be marked in black.





Simplified Soccer

For this project it is necessary that at least 2 teams choose it so they can play against each other. The goal of the project is to build a robot that can play a simplified version of soccer using an IR ball and IR seeker sensors. Two teams will play against each other on a field that has 3 zones: two defense zones that only the robot of the defensive team can be in and a middle zone that both teams' robot can be in. The goal is for each team is to have the ball cross the other team's base line in order to score a goal. Once a goal is scored, the robots are moved into their team's defense zone and the ball is placed in the center. Then the game is started again with the team that has been scored on getting a 1s head start.

Each participating team will receive an IR seeker sensor that provides a direction signal towards the ball which is equipped with a set of IR LEDs. Each robot has to fit within $0.75ft \times 0.75ft$.