LAB 9 ROBOT ARM PATH PLANNING

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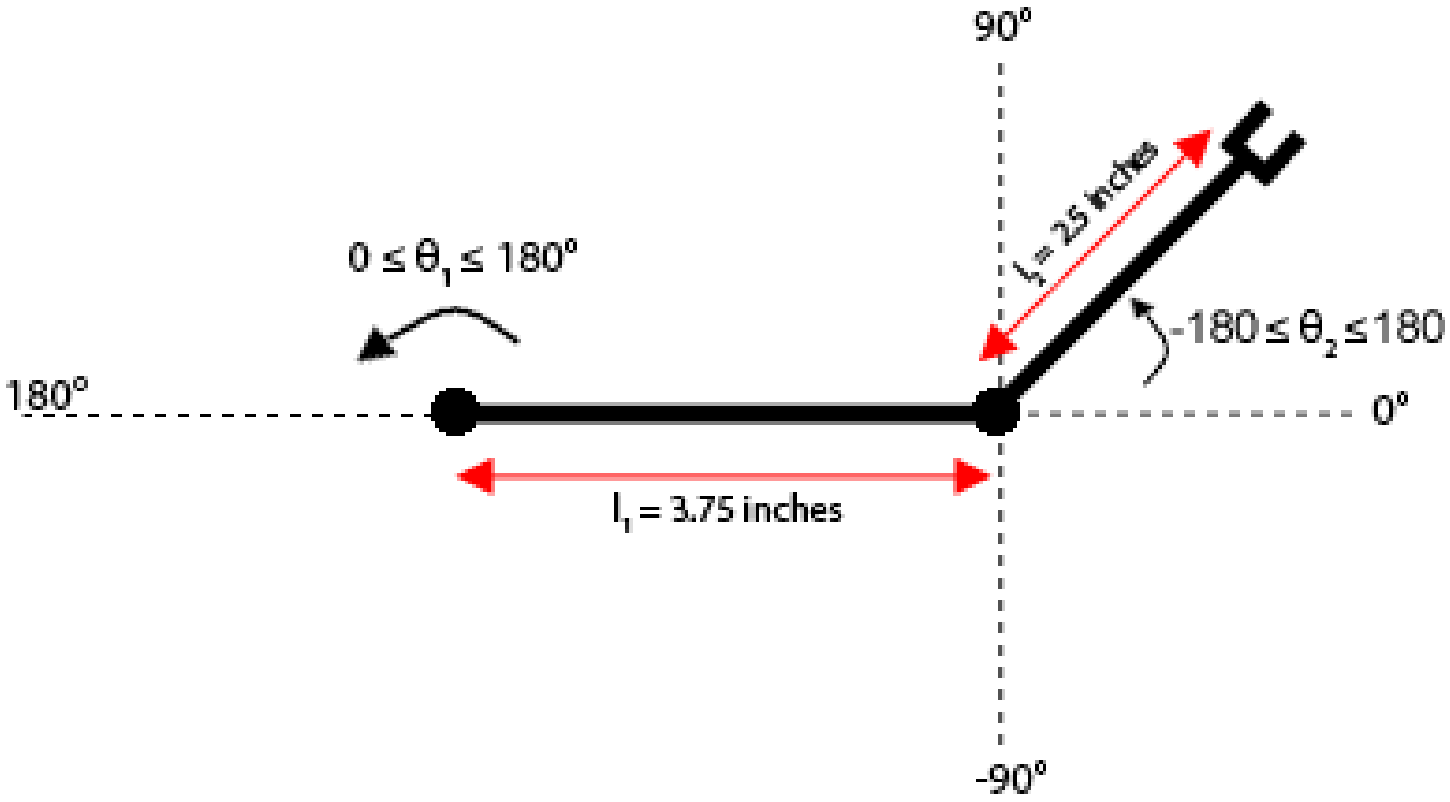
(presentation adapted from Kedar Amladi and Margaret Toebes)

Goal

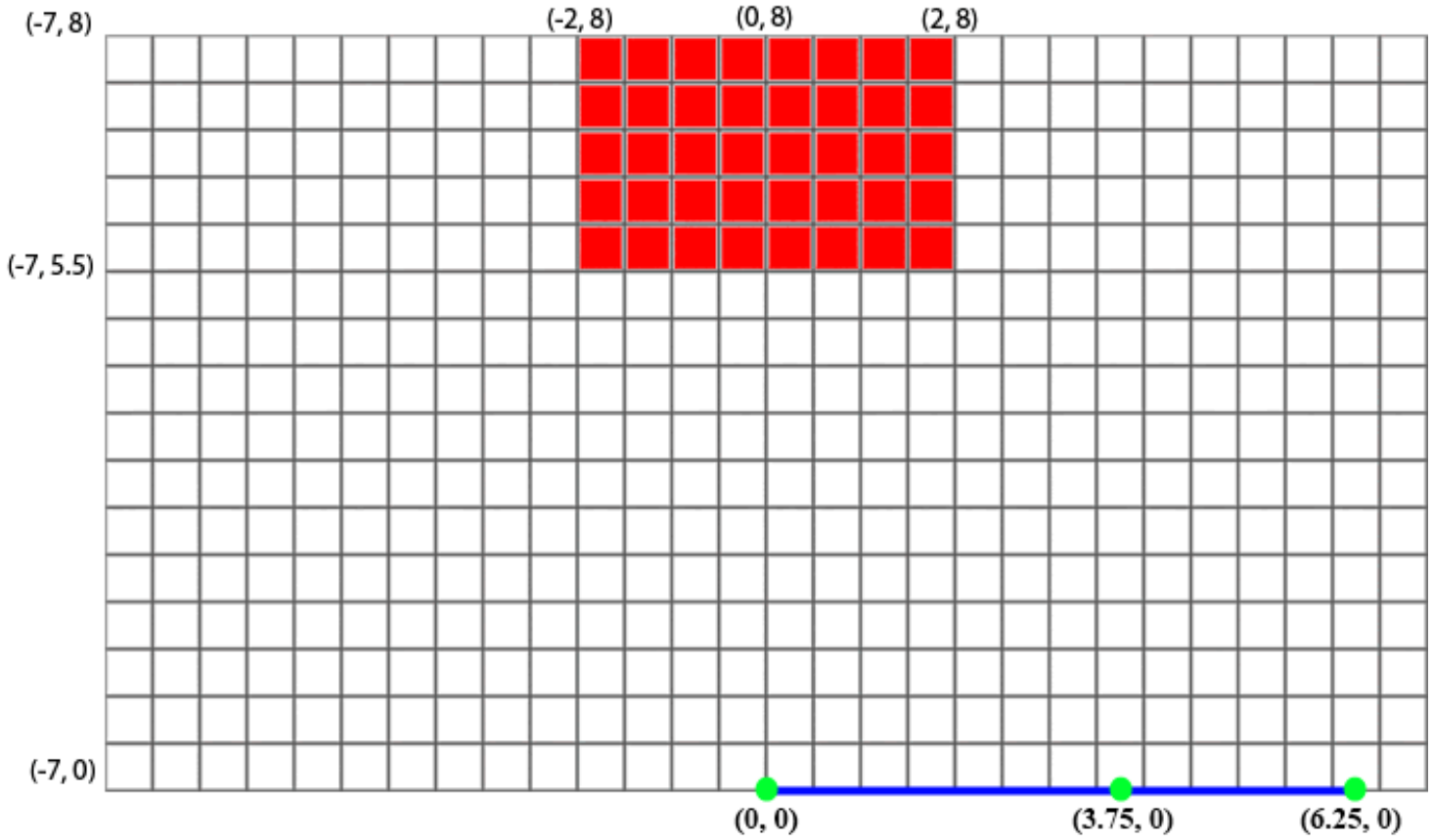
- Build a two link **RR** robot arm and demonstrate inverse kinematics and path planning by safely navigating a known workspace.

The Arm



- The arm should have a stable base that doesn't slide around during the demo
- **Please attach something to the end effector so we can make measurements**
- **You may use other arm lengths, but we can only guarantee that goals will lie in the C-space of this arm configuration.**

Playing Field



Each block is ½ of an inch

Demo

- On demo day, you will be given two (x,y) positions A and B.
- Your robot must navigate from the reference configuration ->A -> B -> A
- Your arm should come to a complete stop at each position, and should not continue until its position is recorded by the grader.
- If your robot arm touches the obstacle or leaves the workspace, your current try ends.

How To (suggestion)

- Map out your robot's configuration space.
- Write a function that will perform inverse kinematic calculations to convert your robot's position into a set of joint angles .
- Follow steps similar to lab 5 by using a set of waypoints that span the space.

Tips

- Make your robot arm as rigid as possible, and gear down the arm motors to increase precision if desired.
- Remember to check all configurations generated by inverse kinematics. Some of the configurations may not be reachable under the existence of the obstacle and the boundaries of workspace.

Demo Grading

- Grade will be the best of three tries.
- A run is worth a total of 65 points:
  - Distance off from A (<.25in, <.50in) – (10,5) points
  - Distance off from B (<.25in, <.50in) – (25,10) points
  - Distance off from A (<.25in, <.50in) – (30,20) points

  - **Distances are calculated using L2 metric.**
  - **Runs end whenever arm hits obstacle or leaves workspace**.

- Four analytical questions to be answered.
- For more details please check the website.

Demo Day

- Next Tuesday: April 19th