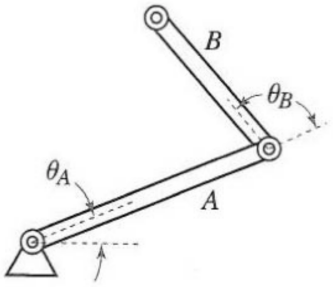
Configuration Spaces

Math 282 Computational Geometry

1. Consider the following robot arm consisting of two rigid segments, with joints that can each rotate in a full circle.

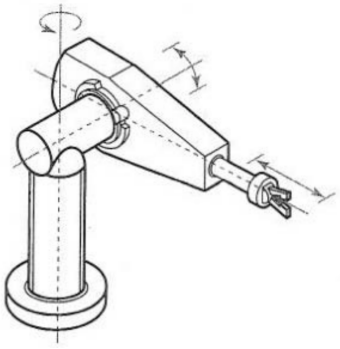


(a) What is the *configuration space* of the robot arm? (Think in terms of the angles!)

(b) What is the *reachability region* of the robot arm — that is, the set of all possible endpoints of the robot arm? How does this depend on the lengths A and B?

(c) Given a point p in the reachability region, how many different configurations of the arm will place the endpoint at p? How can you find these configurations?

2. Consider the following robot arm. Suppose that the base can rotate a full 360 degrees, the joint can rotate 90 degrees, and the arm can extend from 0 to 25 cm.



(a) What is the *configuration space* of the robot arm?

(b) What is the *reachability region* of the robot arm?

Images from Adams and Franzosa, *Introduction to Topology, Pure and Applied.*