Localization 1: Dudek-Romanik-Whitesides Localization

Hypothesis elimination

Hypothesis elimination

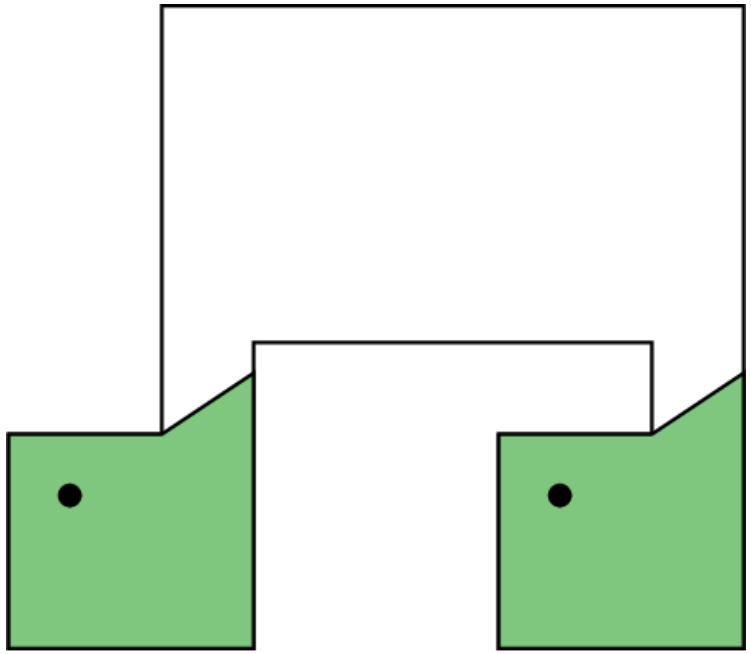
Now that we have a small number of candidate states, how can we determine which candidate is the correct state?

To solve this problem, a localization algorithm should produce a **decision tree**.

- Internal nodes: Motion by the robot, followed by sensing the visibility polygon.
- Edges: A visibility polygon returned by the sensor. (How do we know the number of edges is finite?)
- Leaf nodes: A known final position for the robot.

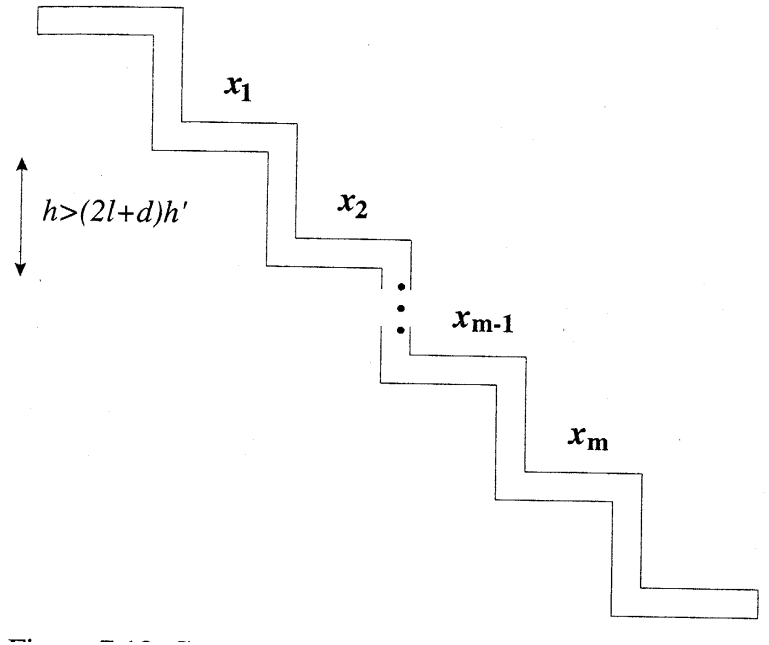
The worst-case path length of such a decision tree is the amount of motion needed to go from the root to the most distant leaf node.

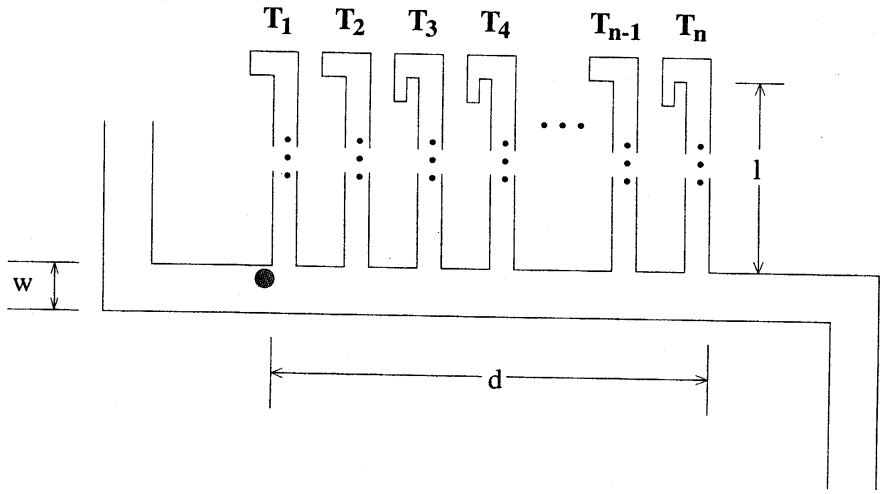
Decision tree example



Bad news

The hypothesis elimination problem is **NP-hard** if we want the shortest path that localizes the robot.





Proof idea: Reduction from Abstract Decision Tree.

The remaining question

So let's forget about optimality and just think about getting some kind of solution. What kinds of motions are helpful?

How can we build a decision tree that localizes the robot?