Albert-Ludwigs-Universität Freiburg
Institut für Informatik
Lecture: Introduction to Mobile Robotics
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Sheet 9

Topic: Path Planning, ICP

Submission deadline: Tue 8.7.2008, 11:00 a.m. (before class)

Exercise 1: Mobile Robot Path Planning

Assume a robot using the 5d-A* technique for path planning.

1. Construct a situation in a static environment without unknown obstacles in which the robot does not find a path close to the optimal solution.
2. Construct a situation in a dynamic environment with unknown obstacles in which the robot does not find a path close to the optimal solution.

Explain (in brief!), why the solutions are far away from being optimal.

Exercise 2: SVD

Suppose, we have two corresponding point sets in 2D:

$$X : \{(x_1 = (2,2)^T,\ x_2 = (6,3)^T,\ x_3 = (5,1)\}$$

$$Y : \{(y_1 = (-0.8,-1)^T,\ y_2 = (-3.7,1.9)^T,\ y_3 = (-1.5,2.1)^T\}$$

and we know, that x_i corresponds to y_i. Please compute the translation t and rotation R that minimizes the sum of the squared error.

Exercise 3: ICP / SVD

Recall the formulas on the slides 5-7 of the ICP-lecture and prove the following:

$$\text{If } X' = P' \text{ then } R = I\ .$$

Hint: Find out, how singular value decomposition and eigen value decomposition are related to each other.