Introduction to Multi-Agent-Programming

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Exercise Sheet 4

Due: November 23th, 2010

R_1	R_2				T_3
R_3					
T_1		T_2			

R_i denotes the robots; T_i denotes their targets. The robots' actions are move **North, South, East, West**. Each action costs 1 time unit. They find the shortest path to a target using Manhattan distance.

When robots plan a path (possibly given another robot's path), the state space is the full state space of all robots, i.e., another robot's path only blocks the current plan, if they would be in the same cell at the same time. Thus states are $(time, cell)$.

Note: This means that, for example, two robots can swap their position.

Annotate your solution, if it is ambiguous.

Exercise 4.1 (Centralized Multi-Robot Path Planning (3 pts))

What are the robot's paths, when the makespan is optimized?

What is the optimal makespan (number of time units)?

The makespan is the overall time, so that all robots have reached their target, moving in parallel (i.e. not the sum of indivual costs, but the maximum end time).

Exercise 4.2 (Prioritized Multi-Robot Path Planning (2 pts))

Consider prioritized path planning and give the robot's paths, if priorities are chosen:

(a) By increasing id (i.e. 1, 2, 3).

(b) How does this change, in the following case, when the cell marked X is an obstacle?

R_1	R_2	X			T_3
R_3					
T_1		T_2			