

Advanced AI Techniques (WS05/06)

Exercise sheet 10 (Game Theory)

Deadline: Tuesday, 31 Jan 06

Exercise 1 (Parameters of multi-agent systems, 4 points)

Give an example for a multi-agent system and describe its attributes: Number of agents, uniformity, goals, etc. according to the list from the lecture.

Exercise 2 (Cooperative and Competitive Actions, 4 points)

a. Give an example for a task in which agents act together in a cooperative way. Describe which elements of planning and which elements of assigning specific tasks are relevant.

b. Give an example for a multi-agent system of competitive agents. Describe the elements of negotiation and strategic actions.

Exercise 3 (Kitchen Cleaning Game, 4 points)

Consider the following n person game: Kitchen Cleaning.

Let n people live in a common household (shared apartment?). The kitchen is untidy and dirty. Each person makes its own decision whether s/he cleans the kitchen. The "reward" for the decision to clean the kitchen is -1 (because it takes time and isn't fun). If at least one person decides to clean the kitchen, everybody profits from having a clean kitchen ($+1$ for everybody). For the person(s) who cleaned the kitchen, the negative and positive rewards are balanced out to a total payoff of 0 . If nobody cleans the kitchen, everybody gets a payoff of 0 (we can just tolerate an untidy kitchen).

a. Formulate this problem in terms of game theory. Give a payoff matrix for the cases $n = 2, n = 3$. For arbitrary n , is there a sequence of iterated elimination of weakly dominated strategies leading to a solution?

b. Now, assume that whenever at least two people decide to clean the kitchen, the "reward" for this decision is $+2$ because working together is more fun and less work. Reformulate the game by adjusting the payoff matrix and determine for the new situation if there is a solution from iterated elimination of strictly dominated strategies.