KTH Microelectronics and Information Technology

Exam in ID2209 Distributed Artificial Intelligence and Intelligent Agents, 2008-12-17, 09:00-13:00

Rules

This exam is "closed book" and you are not allowed to bring any material or equipment (such as laptops, PDAs, or mobile phones) with you. The only exceptions are an English to "your favorite language" dictionary and pencils.

Instructions

- Please read the entire exam first!
- Write clearly
- Each sheet of paper must contain your name, "personnummer", Problem number and a unique sheet number
- Write only on one page of a sheet. Do not use the back side
- Only one Problem must be reported on each sheet
- If more than one sheet is needed the continuation should be clearly noted on the beginning of each sheet and the sheet numbers used should be consecutive
- Always motivate your answers. Lack of clearly stated motivation can lead to a reduction in the number of points given
- The tasks are not necessarily sorted in order of difficulty. If you get stuck it might be a good idea to go on to the next task.

Grading

The grades depend on the sum of exam and bonus points n:
$n < 50$ fail (F)
$50 \leq n < 60$ grade E
$60 \leq n < 70$ grade D
$70 \leq n < 80$ grade C
$80 \leq n < 90$ grade B
$90 \leq n$ grade A
If you are a student from year 2007 or earlier then your bonus points are counted only up to getting grade E

GOOD LUCK!

Mihhail Matskin, mobile 0704614269

Problem I. What is an agent?

1) The availability of TV channels is greatly extended in the information society. Media experts forecast that every household will be able to receive between 300 and 500 television programs in the near future. A quick estimate shows that a systematic search for interesting TV programs would take so much time that there would be hardly any time left to view the selected broadcasts.

Assume that you are supposed to help in solving this problem and to create an intelligent agent for that.

List ALL possible agent properties the intelligent TV agent will have and illustrate these properties by examples.

(7p)

Problem II. Agent theory

a) In the class we considered the Wise Man puzzle (see Appendix) and we also considered possible worlds. What are the possible worlds in this puzzle at the beginning and after each man answer?

(7p)

b) Which axiom(s) from logic of knowledge are not valid in the logic of belief? Explain

(6p)

Problem III. Agent Architectures

a) What are basic types of layered agent architectures for hybrid agents?
Briefly explain their advantages and disadvantages

(5p)

b) Give abstract implementation of the function “action” for symbolic agents and for reactive agents?

(6p)

c) What is a meaning of introduction the “see” function in an abstract agent architecture? Give an example

(5p)

Problem IV. Negotiation

a) What are components of any negotiation setting? Explain them

(4p)

b) Briefly explain idea of the Clark tax algorithm (you are not requested to give in your answer precise formulae used in this algorithm)

(6p)

c) In the prisoner's dilemma there are 4 possible outcomes depending on whether the agents defect or cooperate. They are presented in 4 cells of a payoff matrix. Which of these cells have properties of Nash equilibrium, Pareto efficiency and social welfare? Explain your answer.

(7p)

Problem V. Auctions

a) What is a bidder's dominant strategy in Vicrey auction? Proof your answer. What are benefits of this strategy? What is/are problem(s) with Vicrey auction?

(5p)

Problem VI. Communication

a) What are main components in description of a speech act? Give example.

(5p)

b) Can FIPA ACL be used as an agent development language? Explain.

(4p)

Problem VII. Coordination

a) Give examples of a coordinated action that is cooperative and a coordinated action that is not cooperative.

(4p)

b) What is a difference between a norm and a social law in agent coordination?

(4p)

c) What are fundamental coordination processes? Give a brief explanation.

(4p)

d) Let us consider the Partial Global Planning. Why this planning is partial? And why this planning is global?

(4p)

Problem VIII. Agent-Oriented Software Engineering

a) Show the English auction as agent-interaction protocol in Agent-UML

(6p)

Problem IX. MAS Architectures

a) Who is actor? What operations actor may perform?

(6p)

b) What is a purpose of testbeds in MAS? How do they differ from agent development tools?

(5p)

Appendix

Three men puzzle.

There are three wise men.

It is common knowledge -- known by everyone, and known to be known by everyone, etc. -- that there are three red hats and two white hats. The king puts a hat on each of the wise men, and asks them sequentially if they know the color of the hat on their head. Suppose the first man says he does not know; then the second say he does not know either.

It follows that the third man must be able to say that he knows the color of his hat.

Why this and what color has the third man's hat?

----------End of Exam----------