



**KTH Microelectronics
and Information Technology**

Exam in 2G1524 Distributed Artificial Intelligence and Intelligent Agents, 2004-12-15, 14:00-18:00

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 (U)

$50 \leq n < 67$ grade 3

$67 \leq n < 84$ grade 4

$84 \leq n$ grade 5

GOOD LUCK!

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Problem I. What is an agent?

a) The availability of TV channels will be greatly extended in the information society. Media experts forecast that soon every household will be able to receive between 300 and 500 television programs. 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.

(18p)

Problem II. Agent theory

a) Formalize the following statements in the logic of knowledge (we consider logic of knowledge as a modal logic with K_i operator):

i) Agent B knows that Agent C wants to find out the cost of football tickets.

(5p)

ii) If Agent A does not know the cost of football tickets then Agent B knows that Agent A does not know the cost

(5p)

iii) Agent B doesn't know whether Agent C knows that Agent B doesn't know that Agent A wants to find out the cost of football tickets.

(10p)

b) What is relation between knowledge and belief in the works on agent theory? Discuss appropriateness of the Modal logics axioms D, T, 4 and 5 for logics of knowledge and belief.

(10p)

Problem III. Negotiation

a) Give advantages and disadvantages of the use of Contract Net Protocol (CNP)

(3p)

b) What auction type(s) is/are most close to the basic CNP schema? Explain why.

(5p)

c) What is a bidder's dominant strategy in Vickrey auction? Prove your answer.

(7p)

d) Explain the notion of Nash equilibrium. Give an example.

(5p)

Problem IV. Communication

a) Can Agent Communication Language (ACL) be used as an agent development language? Explain.

(5p)

b) Is it possible to write an ACL message where the content is also expressed in ACL? If no, justify. If yes, give an example.

(5p)

Problem V. Agent Architectures

- a) What are the basic types of layered agent architectures? (3p)
- b) What kind of a layered architecture is Brooks subsumption architecture? Explain. (5p)

Problem VI. Coordination

- a) Describe common coordination techniques and compare them in terms of predictability, reactivity and amount of information exchange. (5p)
- b) What are fundamental coordination processes? Give a brief explanation. (5p)

Problem VII. Mobile Agents

- a) What is/are the difference(s) between remote execution and a mobile agent? (4p)

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