KTH Microelectronics and Information Technology

Exam in ID2209 Distributed Artificial Intelligence and Intelligent Agents, 2009-12-18, 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 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 side 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

GOOD LUCK!

Mihhail Matskin, mobile 0704614269

Problem I. What is an agent?

a) If traffic lights (together with their control systems) are to be considered as intelligent agents, which of all possible agents' properties they will employ and which properties they will not employ? Illustrate your answer by examples.

(6p)

b) What are main differences between agents and objects?

(4p)

Problem II. Agent theory

a) Why do we consider agents as intentional systems? When such consideration is most useful?

(5p)

b) Let us assume that "whether x" is equal to "$\Diamond x \wedge \Diamond \neg x$" in modal logic. Express in the logic of knowledge the following statement:

"I don't know whether I know the answer to this question"

Explain your answer.

(7p)

c) Explain notions of "common knowledge" and "distributed knowledge". Give examples.

(5p)

Problem III. Agent Architectures

a) Explain advantages and disadvantages of symbolic, reactive and hybrid agents.

(4p)

b) What would be an implementation (in a pseudo-code) of the function "action" for an agent employing BDI architecture?

(6p)

c) Explain the following notions: theoretical reasoning, practical reasoning, deliberation and means-end analysis. Give examples.

(6p)

Problem IV. Negotiation

a) What is/are difference(s) between task-oriented and worth-oriented domains?

(4p)

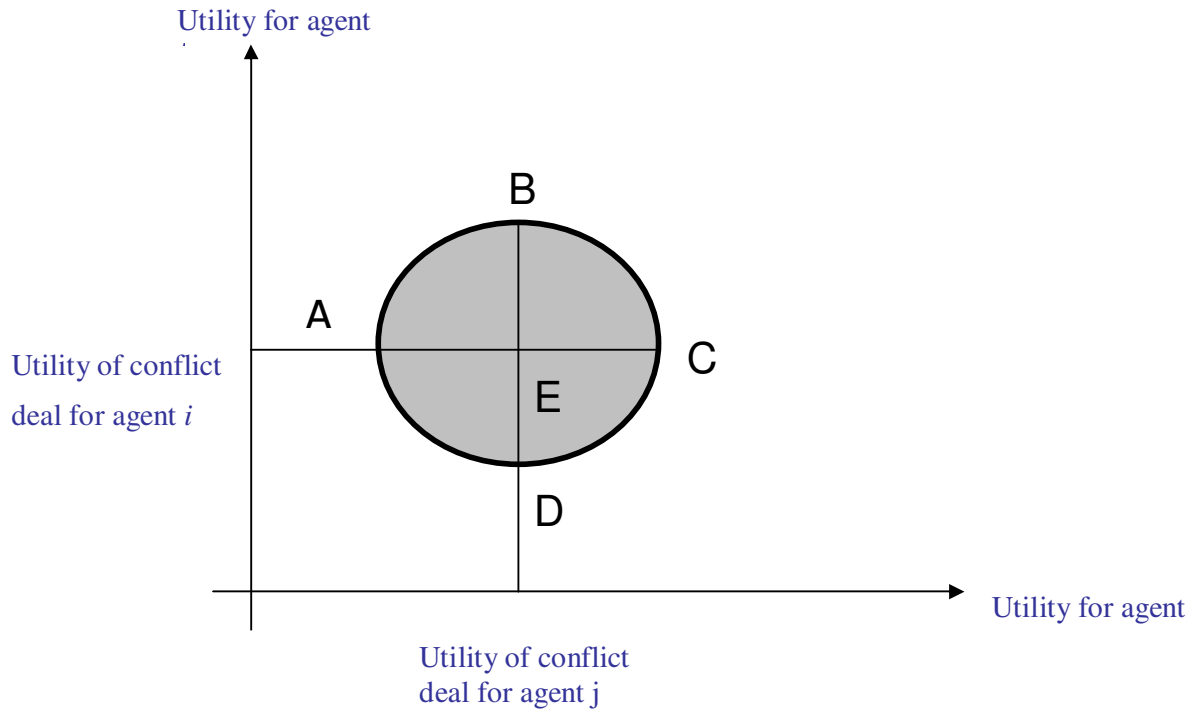
b) Explain what is utility and what is preference and how they are related?

(4p)

c) What is/are difference(s) between Phantom and Decoy tasks?

(4p)

d) We considered the following figure in the class:



Show on the figure points/areas for:
conflict deal, negotiation set, possible deals, Pareto optimal deals and individually rational deals.
Explain your answer.

(6p)

e) Why the solution obtained by using Nash equilibrium strategy in the Prisoner's dilemma is not completely satisfactory for participants?

(4p)

Problem V. Auctions

a) We considered the second-price-sealed-bids or Vickrey auction. Does it make sense to have second-price-open-bids auction? Justify your answer

(5p)

Problem VI. Communication

a) Explain how different performative verbs applied to the same propositional content can express different speech acts. Give an example.

(5p)

b) What are main motivations for developing KIF?

(5p)

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

(4p)

Problem VII. Coordination

a) Compare different Organizational structures in terms of: 1)sharing processing agents, 2) number of required messages to be sent for task allocation and 3) results of failure of processing agents, functional managers and product managers.

(6p)

b) Explain what is “Explicit analysis and synchronization” in agent coordination. What are its pros and cons?

(5p)

Problem VIII. Agent Oriented Software Engineering

a) Which modifications to UML sequence diagrams are proposed in AgentUML? Give examples.

(5p)

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