Written Exam
Multi Agent Systems
Course code: 232060
November 8, 2007.
Time: 9.00 – 12.00 hour

Remarks:

- You may answer the questions in Dutch.

Question 1: Agent Architectures

Consider the robotic vacuum cleaner agent described in page 51 – 54 of the course book.

Part a

What will be exact value of *old*(Δ) in case of:

1. $\Delta = \{In(0,1), Facing(north), Dirt(0,1)\}$
2. $\Delta = \{In(0,1), Facing(north), \neg Dirt(0,1)\}$

Explain your answer!

Part b

What will be the value of *new*(Δ,p) in case of:

1. $\Delta = \{In(0,1), Facing(north), Dirt(0,1)\}$ and the percept $p = dirt$.
2. $\Delta = \{In(0,1), Facing(north), \neg Dirt(0,1)\}$ and the percept $p = null$.

Explain your answer!

Part c

Give an example of a state based agent (pg. 36 of the course book) for which there is **no** *purely reactive* agent (pg. 36 of the course book) with the same (equivalent) behavior. **Explain your example!**

Question 2: Multi-agent Interaction

Consider the following interaction scenario.

	1 defects	1 cooperates
2 defects	2 2	1 5
2 cooperates	5 1	4 4

- Informally analyze the scenario and determine what the two agents should do.
- Classify the preferences the agents have with respect to outcomes.
- Determine which strategies are strongly or weakly dominant.
- Determine the Nash equilibria.

Part b.

Now consider the following interaction scenario.

	1 defects	1 cooperates
2 defects	2 2	1 5
2 cooperates	3 3	4 4

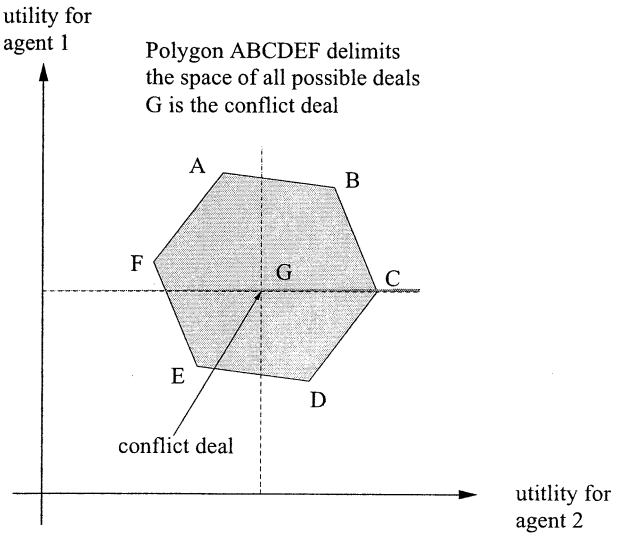
- Informally analyze the scenario and determine what the two agents should do.
- Classify the preferences the agents have with respect to outcomes.
- Determine which strategies are strongly or weakly dominant.
- Determine the Nash equilibria.

Part c

Give an example of an interaction scenario in which the Pareto optimal deal is different from the Nash equilibrium. **Explain your example!**

Question 3: Reaching Agreement

Two agents, 1 and 2, are negotiating about a certain deal. The possible set of deals is depicted in the figure below, including the conflict deal.



Part a

Describe which deals are individual rational for agent 1.

Part b

Describe which deals are *Pareto optimal* for agents 1 and 2?
Explain you answer!

Part c

Give the *negotiation set* for agent 1.

Part d

Given the above set of possible deals, explain how the *monotonic concession protocol* unfolds over time.
Will the protocol always terminate?

Question 4: Communication

How would you classify the following FIPA speech acts in terms of the classification of speech acts by Searle? Explain your answer.

1. inform,
2. cfp,
3. not-understood,
4. request-when,
5. refuse