Exam for IN1905TU Kennistechnologie

27 March 2007

This exam will test your knowledge and understanding of the material provided to you and presented in the lectures and the book of Michael Wooldridge, *An Introduction to Multi-Agent Systems*. Using the book during the examination is *not* allowed. You will have 3 hours (from 9 till 12) to complete the exam. It has 5 questions, for a total of 91 points. Please don't include irrelevant information: you will be marked down for this. Before you hand in your answers, please check that you have put your name and student number on top of every sheet you hand in.

Questions

Question 1 *18 points*

Recommender systems for movies are internet applications that try to predict whether a user will like a movie or not. Such systems maintain an up to date database of movies and exploit previous user input using a technique known as automated collaborative filtering. The system will predict that you will like a movie using previous input on your preferences and information about other people with similar preferences that also like this particular movie.

Recommender systems use intelligent agents to build up a complex profile of user preferences. You can tell a recommender system which movies you like, and it will start to build up a profile of your tastes. Once the system starts to recommend movies to you it will also give you the opportunity to rate these movies on a scale from "don't know" to "the best!". As you continue to add your ratings, the system continuously expands the personal profile of you which it maintains.

(a) (12 points) Which of the following properties apply to the environment of a recommender system? Explain your answer.

- accessible or inaccessible
- deterministic or indeterministic
- static versus dynamic

Solution: See the book, p. 18. Explain each term and clarify your choice.

(b) (6 points) Give one of the capabilities of intelligent agents that you think are also important for a recommender system. Explain the capability and your choice.

Solution: See the book, p. 23 for an explanation of important agent capabilities and use this to explain your choice.

Question 2 *20 points*

Consider the picture of the control flow in AGENT0:

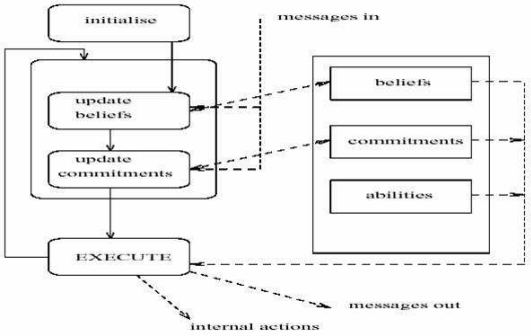

Figure 1: AGENT0 control flow

(a) (3 points) Can the AGENTo programming language be classified best as a symbolic, hyrbid, or reactive approach to agent implementation? Explain your answer.

(b) (7 points) Explain each step in the control flow.

(c) (10 points) Name an application domain that you think this programming language could be usefully applied. Give reasons why you think so. List some of the beliefs, commitments and abilities that an agent implementing your application needs.

Solution: See the book, p. 54-55 and the lecture slides.

Question 3 *13 points*

Consider the semantic network below:

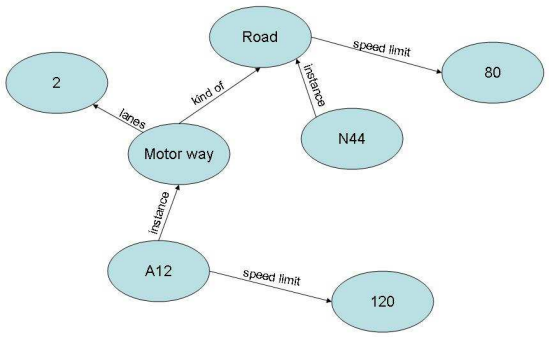

Figure 2: Roads - Semantic Network

(a) (5 points) Describe all the information that can be inferred from the semantic network about the A12.

(b) (8 points) The A12 has various parts that have different speed limits. There are multiple parts with limits of 100 km and multiple parts with limits of 120 km, assume 2 of each. Additionally, sometimes a part of the road is being repaired and the speed limit temporarily is 70 km. Extend the network to incorporate this additional information and draw a new extended network.

Solution: See the lecture slides about Semantic Networks.

Question 4 *20 points*

This question concerns knowledge-based systems.

(a) (5 points) Which inference strategy is more suitable for a diagnostic system: Backward or forward chaining? Motivate you answer.

(b) (5 points) A group of biologist studying local flora in your region asked you to design an expert system that would help them to catalogue all the variety of the plants. Which knowledge representation model - logic, semantic networks, and frames - would you choose for this purpose? Motivate your answer.

(c) (10 points) Consider the diagnostic problem below:

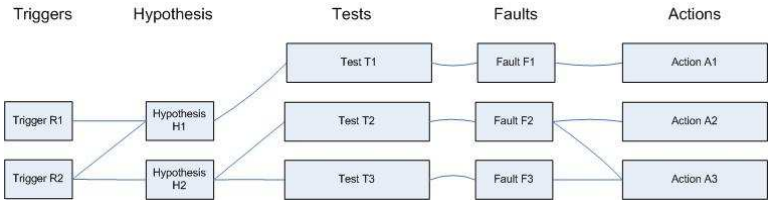

Figure 3: Diagnosis Problem

Write a rule base for this diagnostic problem.

Question 5 *20 points*

Which coordination strategy would you suggest in the scenarios below to obtain an optimal result: Contract Net, Mutual Modelling, Joint Intentions, and Global Partial Planning, Norms and Social Laws? For each case, motivate your answer.

(a) (10 points) A small logistics company does not have trucks or drivers itself. Instead, it employs independent truck-drivers with own vehicles. Please, advise the company on the coordination model.

(b) (10 points) Activities inside the EWI building of TU Delft rely partly on the efficiency of coordination of four high-speed lifts. The lifts use a coordination strategy to bring people up and down quickly with minimal waiting time. But it appears that lifts do not use their full potential of elevation speed due to a big number of short rides between two neighboring floors.

End of exam