Multiagent Systems

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Summer term 2014

Exercise Sheet 1

Due: Friday, May 9, 2pm

Important: Each exercise sheet is to be solved in groups of **two students**. Thus, please note your names on each solution sheet and, if applicable, in the source code (as a comment on top of each source file).
After SVN-accounts have been created for you, the solutions are to be handed in as pdf or plain text files (UTF-8 encoded). We strongly suggest the use of LaTeX for typesetting your solutions.
You might complete your solutions in English or German.

Exercise 1.1 (Revision control system "subversion"; 2 points)

Subversion is a free revision control system "to maintain current and historical versions of files such as source code, web pages, and documentation." (wikipedia article: `http://en.wikipedia.org/wiki/Apache_Subversion`). Please, get yourself accustomed to SVN by reading the relevant parts of the following webpages (or simply refresh your memory a bit):

`http://svnbook.red-bean.com/en/1.7/index.html`

Exercise 1.2 (Expected utility over runs; 2 points)

Consider the environment $Env_1 = \langle E, e_0, \tau \rangle$ defined as follows:

$$E = \{e_0, e_1, e_2, e_3, e_4, e_5\} \tag{1}$$

$$\tau(e_0 \xrightarrow{\alpha_0}) = \{e_1, e_2\} \tag{2}$$

$$\tau(e_0 \xrightarrow{\alpha_1}) = \{e_3, e_4, e_5\} \tag{3}$$

There are two agents possible with respect to this environment:

$$Ag_1(e_0) = \alpha_0 \tag{4}$$

$$Ag_2(e_0) = \alpha_1 \tag{5}$$

The probabilities of the various runs are as follows:

$$P(e_0 \xrightarrow{\alpha_0} e_1 | Ag_1, Env_1) = 0.4, \tag{6}$$

$$P(e_0 \xrightarrow{\alpha_0} e_2 | Ag_1, Env_1) = 0.6, \tag{7}$$

$$P(e_0 \xrightarrow{\alpha_0} e_3 | Ag_2, Env_1) = 0.1, \tag{8}$$

$$P(e_0 \xrightarrow{\alpha_0} e_4 | Ag_2, Env_1) = 0.2, \tag{9}$$

$$P(e_0 \xrightarrow{\alpha_0} e_5 | Ag_2, Env_1) = 0.7, \tag{10}$$

Assume the utility function u_1 is defined as follows:

$$u_1(e_0 \xrightarrow{\alpha_0} e_1) = 8, \tag{11}$$
$$u_1(e_0 \xrightarrow{\alpha_0} e_2) = 11, \tag{12}$$
$$u_1(e_0 \xrightarrow{\alpha_1} e_3) = 70, \tag{13}$$
$$u_1(e_0 \xrightarrow{\alpha_1} e_4) = 9, \tag{14}$$
$$u_1(e_0 \xrightarrow{\alpha_1} e_5) = 10, \tag{15}$$

What are the expected utilities of the agents for this function?

Exercise 1.3 (Rock-paper-scissors, 4 points)

Model the game "rock-paper-scissors" as a system $\mathcal{R}(Ag, Env)$. One session of this game consists of ten rounds and the agent, which wins most of the rounds, wins the session.
First, construct a system with your agent being a purely reactive agent, then construct a system, in which your agent takes the environment history into account.

Exercise 1.4 (Self-report; 2 points)

Please write a short report (minimum six lines of plain text per student) about your motivation to join the lecture and your background experience with programming languages, robotics, multiagent systems, and anything else you find relevant to this topic.

(Please state clearly, which section of the text is written by whom of you. Thank you.)