

Agent-Based Systems

Tutorial 1

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Q1 For which of the following applications would an agent-based solution be appropriate?

1. A word processing software suite
2. An MP3 player with wireless networking capabilities
3. An automated monitoring system for a national railway network

Consider, for each application, a single-agent and a multiagent solution separately. Give reasons for your answer.

Q2 Prove or refute the following statements:

1. For every purely reactive agent, there is a behaviourally equivalent standard agent.
2. For every standard agent, there is a behaviourally equivalent purely reactive agent.
3. For every state-based agent there is behaviourally equivalent standard agent.
4. For every standard agent there is behaviourally equivalent state-based agent.
5. Every utility function defined over runs can be expressed by a utility function defined over states.
6. Every utility function defined over states can be expressed by a utility function defined over runs.

Q3 The game of rock-paper-scissors is a single-shot two-player game in which each agent can pick from either of three moves R , P and S simultaneously. The result is evaluated using the following rules:

- P beats R
- R beats S
- S beats P
- all other combinations result in a tie

Assume our opponent (the “environment”) plays P with probability 0.4, S with probability 0.5, and R with probability 0.1.

- (a) Specify an *optimal* (stochastic) agent for this problem according to the MEU criterion given that the utility for losing the game is -1 and the utility for winning is +1, 0 for a tie.
- (b) Can you generalise the result for *any* opponent strategy rather than the one defined in part (a)?