



DEPARTAMENTO DE INFORMÁTICA
UNIVERSIDAD CARLOS III DE MADRID

Grado en Ingeniería Informática

Artificial Intelligence
May 2015

General instructions

- Time assigned to the exam is **2 hours**
- Teachers will not answer any question about the exam
- You cannot leave the classroom during the exam, unless you have finished it
- Exams cannot be answered using a pencil

Theory questions

We expect very short answers.

- 1 point Explain Bayes Theorem. What are the “a priori” probabilities? And the “a posteriori”? Show an example of its use in a given application. Which are the variables? Provide also an example of an inference.
- 1 point Each node in a Bayesian network contains a probabilities matrix. How is it called? What does it represent? What is it used for?
- 1 point Enumerate a processes or set of processes that should be executed before path planning in robotic applications. Mention one technique from the ones that we have covered during the course that can be used to perform that task.
- 1 point How do you define an MDP? Specify its components by using an example.
- 1 point How does an artificial neuron work? How do you combine several artificial neurons to form an artificial neural network?
- 1 point Show an example of a rule base with at least five rules and six propositions in propositional logic. Describe the first two cycles of execution given an initial contents of the working memory (you also choose it).
- 1 point Describe three advantages of A* with respect to uninformed depth-first search.
- 1 point Why do we have efficient compilers for programming languages and we do not have such efficient compilers for natural language understanding? Use an example in the explanation.
- 1 point In a robotic application, we would like to use fuzzy logic to control the robot to avoid obstacles. Define a relevant variable, three possible values, and their corresponding membership functions. Also, present an example of a rule to control its behavior, possibly using another fuzzy variable.
- 1 point What does the Turing test measure? Present an example of a system passing the test.

Questions on the practice

- Explain the relationship between the random variables *Attack* and *Strategy* in your final (or best) Risk agent. Explain the meaning of each possible strategy for that agent.
- Explain the purpose of the strategy network. What variables are included in this network in your final agent? How did you define the probability distributions for this network?