CS422 Spring 2005
Assignment 5

Due: 2:00pm, Thursday 7 April 2005.

The aim of this assignment is to learn more about representing knowledge and about inference in decision networks.

Please read and post to the bulletin in the course WebCT site for hints and questions. Note that this assignment is designed to get you to think and learn, not to test your pre-existing knowledge (or that you have absorbed what has been covered in class). You will only learn this stuff by trying it out. Please make sure you start this assignment early!

Question 1

Students have to make decisions about hum much to study for each course. The aim of this question is to investigate using decision networks to help them make such decisions for for a course.

Suppose students first have to decide to study for the midterm. They can study a lot, study a little, or not study at all. Whether they pass the midterm depends on how much they study and how difficult the course is. As a first order approximation, they pass if they study hard or if the course is easy and they study a bit. After receiving their midterm grade, they have to decide how much to study for the final exam. Again the final exam result depends on how much they study and how difficult the course is. Their final grade depends on which exams they pass; generally they get an A if they pass both exams, a B if they only pass the final, a C if they only pass the midterm and an F if they fail both. Of course there is lots of noise in these general estimates.

Suppose that their final utility depends on their total effort and their final grade. Suppose the total effort is obtained by adding the effort in studying for the midterm and the final.

(a) Draw a decision network for a student decision based on the above story.

(b) What is the domain of each variable?

(c) Give appropriate conditional probability tables.

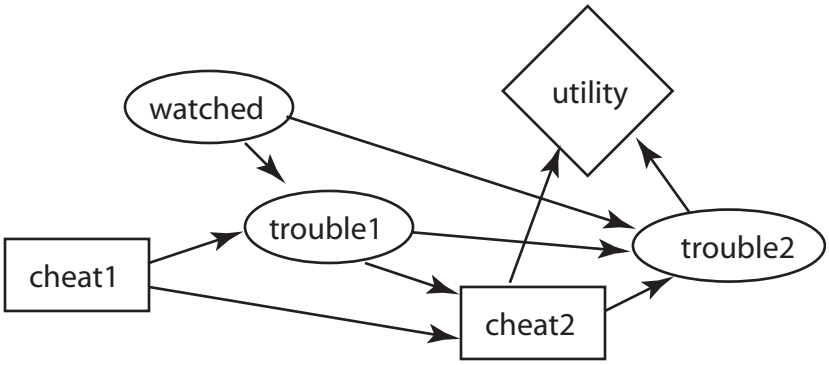
(d) What is the best outcome (give this a utility of 100) and what is the worst outcome (give this a utility of 0)?

(e) Give an appropriate utility function for a student who just wants to pass. What is the optimal policy for this student?

(f) Give an appropriate utility function for a student who want to do really well. What is the optimal policy for this student?

Question 2

Consider the belief network:



The probabilities are available from the cs422 web site. This is supposed to model a decision about whether to cheat at two different time instances.

(a) What is the optimal decision function for the variable *cheat*2? Show what factors are created. Please try to do it by hand, then check it with the CIspace applet.

(b) What is the optimal policy?

(c) What happens to the optimal policy if the probability of being watched goes up? What happens to the optimal policy when the rewards for cheating are reduced? What happens to the optimal policy when the instructor is less forgiving (or forgetful) of previous cheating?

Question 3

(a) How long did you spend on each question? Was it reasonable?

(b) What did you learn?