Faculteit Wiskunde en Informatica Vrije Universiteit, Amsterdam Joris Hulstijn	**Re-exam Knowledge-based Systems** Wednesday 14th of August, 13.30 - 16.30

2002

Assessment:

Exercise 1	Exercise 2	Exercise 3	Exercise 4	Exercise 5	extra
10 + 15	10	10 + 10	10 + 10	15	10

Exercise 1: General

a. A number of *phases* can be distinguished during the development of a knowledge-based system. Describe the phases, their end products and the most typical methods used during those phases.

b. In a controversial interview, Prof. van den Herik (Universiteit Maastricht) predicted that in 30 years time decision support systems will give advice or even replace government on issues concerning economic and social policies. What do you think of this prediction? Argue in at most 12 lines why you think this prediction will come true, or not. Make use of the success conditions for application of knowledge-based systems.

Exercise 2: Classification

Consider the *covering relatie* C.

C	S_1	S_2	S_3	S_4
D_1	1	?	1	?
D_2	?	0	0	?
D_3	?	?	1	1
D_4	0	?	?	?
D_5	?	1	?	0

Suppose we offer the following data vector, D = (1 ? ? 0 1). Indicate for each solution whether it is *inconsistent*, *consistent* or a *match*. First draw a graphical representation of the relation *C*.

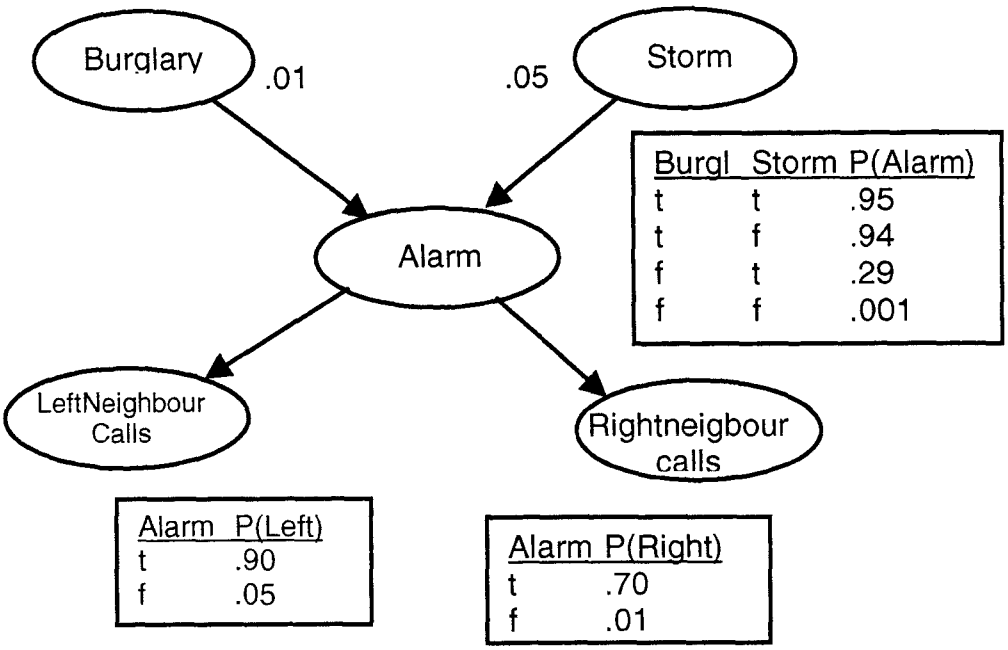

Figure 1: Bayesian network for burglary alarm

Exercise 3: Representation of uncertainty

A lady has bought a burglary alarm for her holiday home. She agreed with her neighbours that they will phone her in case the alarm goes off. This type of alarm usually works in case of a burglary, but it may misfire in case of a storm. The initial probability of burglary is 1% and the probability of a storm is 5 %. The conditional probabilities of the various events are given in the Bayesian Network of figure 1. For example, the chance that the alarm goes because of a storm but without a burglary $P(Alarm = t \mid Burgl = f, Storm = t)$, is 29 %.

a. Suppose that the alarm goes off; what is the probability that none of the neighbours will call?

b. Given the fact that it is storming, calculate the probability that the lady is called by the left neighbour.

Exercise 4: Configuration

a. Give the definition of a *constraint satisfaction problem* (CSP).

b. Explain briefly what is meant by the *threshold effect*. Give an example.

Exercise 5: Diagnosis

DARN is a system to diagnose broken photocopy machines. The system makes use of a kind of flow-charts, in which all actions and observations are described systematically. This approach is also useful for other diagnosis and repair tasks. The following procedure describes how to debug a Prolog programme.

- *Check if the programme is running properly.*
- *If not, test if the programme can be compiled at all.*
- *If the programme can not be compiled, use the error messages to debug the programme and improve it.*
- *If the programme can be compiled, test if the procedure call corresponds to the programme definition. Use any warnings about variables after compilation, to check and correct the use of variables.*
- *If the procedure call and the use of variables are all right, you must have made a design error. In case the programme is recursive, check the stop condition and the recursion step. Otherwise you must debug the programme step-by-step, until the fault is found and corrected.*

Draw a DARN-like flow chart for debugging Prolog programmes. Use the following basic components: