

AITA - Exercise Sheet 6

This week we have two questions on Production Systems taken from past exam papers, plus a more open ended question.

Question 1 (Based on Question 1 in May 2000 AI Techniques Exam)

We shall work with the following system of rules and facts, where the variable x stands for a patient, “red_spots(x)” stands for “patient x has red spots”, and so forth.

Rules:

R1:	IF: fever(x) & red_spots(x) THEN: measles(x)	R5:	IF: measles(x) THEN: contagious(x)
R2:	IF: runny_nose(x) THEN: cold(x)	R6:	IF: meningitis(x) THEN: contagious(x)
R3:	IF: cold(x) THEN: contagious(x)	R7:	IF: contagious(x) & dangerous(x) THEN: isolated(x)
R4:	IF: fever(x) & stiff_neck(x) THEN: meningitis(x)	R8:	IF: meningitis(x) THEN: dangerous(x)

Initial facts:

runny_nose(mary) stiff_neck(john) fever(john)
red_spots(mary) fever(mary)

- (a) What are the basic components of a Production System? Describe what is meant by a “Recognize-Act Cycle” and why it is relevant to production systems.
- (b) What do “matching” and “binding” mean in this context? Give examples from the above system.
- (c) How is the conflict set defined in general and what is the initial conflict set in the above system? How would you resolve the conflict in this case? Give reasons for your answer.
- (d) What can be derived from this knowledge base by forward reasoning? Explain your answer in detail.

- (e) How can isolated(john) be derived by backward reasoning?
- (f) Under which conditions would a mixture of forward and backward reasoning be advisable?

Question 2 (Based on Question 3 in May 2002 AI Techniques Exam)

- (a) Outline the principal components of a Production System.
- (b) In this context, explain the importance of “binding”, “matching” and “conflict resolution”.
- (c) Suppose you have a production system with the three rules:

R1: IF A , THEN E

R2: IF B AND F , THEN G

R3: IF C AND E , THEN F

and you have four initial facts: A, B, C, D.

Explain what is meant by “backward chaining” and show explicitly how it can be used to determine the truth, or otherwise, of fact G.

Question 3

The system described in Question 1 might be regarded as the basis of a very simple medical diagnosis system. What other features could be added to that system in order to make it more useful?