

Assignment #1

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Duration: 2 weeks

Question 1 (10pts)

What is the main difference between *conventional computer programs* and *rule-based systems*?

Question 2 (10pts)

What are the *main components* of a rule-based system? Describe a *well-known rule-based expert system*.

Question 3 (20pts)

Consider the following production rule:

IF *apple* THEN *eat*

- What is the *antecedent* of this rule?
- What is the *consequent* of this rule?
- Which part of the rule will be matched against the *working memory* (contains on facts describing the current state of the problem) in case of *forward chaining*?
- And in case of *backward chaining*?

Question 4 (30pts)

The following is the rule set of a simple weather forecast expert system:

1	IF	<i>cyclone</i>	THEN	<i>heavy clouds</i>
2	IF	<i>anticyclone</i>	THEN	<i>clear sky</i>
3	IF	<i>pressure is low</i>	THEN	<i>cyclone</i>
4	IF	<i>pressure is high</i>	THEN	<i>anticyclone</i>
5	IF	<i>arrow is down</i>	THEN	<i>pressure is low</i>
6	IF	<i>arrow is up</i>	THEN	<i>pressure is high</i>

- Use *forward chaining* to reason about the weather if the working memory contains the fact: *arrow is down*. Show your answer in a table naming the *rules* matching the *current working memory*

(*conflict set*), which rule you apply, and how the working memory contents changes on the next cycle after a rule has *fired*:

Cycle	Working Memory	Conflict set	Rule fired
:	:	:	:

Ex:

Cycle	Working Memory	Conflict set	Rule fired
0	arrow is down	5	5
:	:	:	:

- b) Use *backward chaining* to reason about the weather if the working memory contains the fact: *heavy clouds*. Show your answer in a similar table.
- c) Suppose that the user interface of our Expert System allows the system to ask a user about the facts whether they are true or false. What question (or questions) the system should ask the user to conclude that *the sky is clear*? What will the user answer? Which rule will require the clarification from the user?

Question 5 (30pts)

Consider the following familiar set of rules:

1	IF	<i>green</i>	THEN	<i>drive</i>
2	IF	<i>red</i>	THEN	<i>wait</i>
3	IF	<i>yellow</i> OR (<i>red</i> AND <i>blinking</i>)	THEN	<i>drive slowly</i>
4	IF	<i>green</i> AND <i>blinking</i>	THEN	<i>hurry</i>
5	IF	<i>red</i> OR <i>green</i> OR <i>yellow</i>	THEN	<i>traffic light works</i>

- a) Which of the above rules will be put into a *conflict set* (the *current working memory*) by the system if the working memory contains two facts: *green*, *blinking*? Explain why each rule is selected or not.

Ex:

The conflict set will contain rules: 1,

Because:

- Rule 1 matches the fact *green* in the working memory (WM).
- b) Which of the rules would fire if we used the *specificity conflict resolution strategy*? Explain why.