FORWARD CHAINING AND BACKWARD CHAINING

Forward Chaining

- It is the form of reasoning which starts with input data facts in the knowledge base and applies inference rules in the forward direction to extract more data until a goal is reached.
- When decision is taken based on the available data then the process is called as forward chaining.

Properties

- It moves from bottom to up (top)
- It is a process of making a conclusion based on known facts or data by starting from the initial state and reach the goal state.
- It is otherwise called as data driven approach.
- Forward chaining is used in Expert systems

Backward Chaining:

A backward chaining algorithm is a form of reasoning, which starts with the goal and works backward , chaining through the rules to find the known facts that supports the goal.

Properties

- It is known as top down approach
- In backward chaining goal is broken into sub goal and sub goals to prove the facts.
- It is otherwise called as goal driven approach, in which a list of goal decides which rules are selected and used.

Forward chaining is a techniques for drawing inferences from Rule base. Forward-chaining inference is often called data driven.

‡ The algorithm proceeds from a given situation to a desired goal,adding new assertions (facts) found.

‡ A forward-chaining, system compares data in the working memory against the conditions in the IF parts of the rules and determines which rule to fire.

Backward chaining is the best choice if:

The goal is given in the problem statement, or can sensibly be guessed at the beginning of the consultation; or:

The system has been built so that it sometimes asks for pieces of data (e.g. "please now do the gram test on the patient's blood, and tell me the result"), rather than expecting all the facts to be presented to it.

This is because (especially in the medical domain) the test may be expensive, or unpleasant, or dangerous for the human participant so one would want to avoid doing such a test unless there was a good reason for it.

Forward chaining is the best choice if:

All the facts are provided with the problem statement; or:

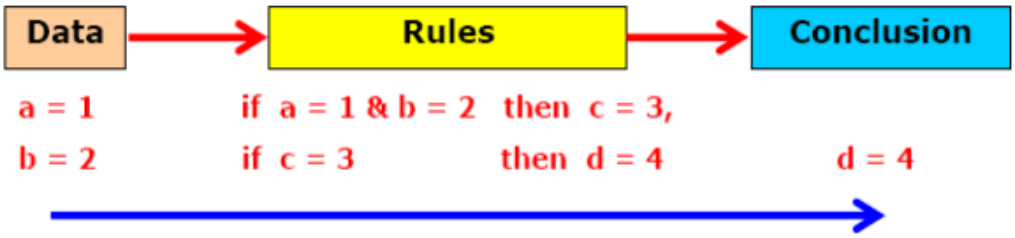
There are many possible goals, and a smaller number of patterns of data; or:

There isn't any sensible way to guess what the goal is at the beginning of the consultation.

Note also that a backwards-chaining system tends to produce a sequence of questions which seems focussed and logical to the user, a forward-chaining system tends to produce a sequence which seems random & unconnected.

If it is important that the system should seem to behave like a human expert, backward chaining is probably the best choice.

‡ Data Driven



Example : Forward Channing

■ Given : A Rule base contains following Rule set

Rule 1: If A and C Then F

Rule 2: If A and E Then G

Rule 3: If B Then E

Rule 4: If G Then D

■ Problem : Prove

If A and B true Then D is true

Solution :

(i) Start with input given A, B is true and then

start at Rule 1 and go forward/down till a rule

“fires" is found.

First iteration :

(ii) Rule 3 fires : conclusion E is true

new knowledge found

(iii) No other rule fires;

end of first iteration.

(iv) Goal not found;

new knowledge found at (ii);

go for second iteration

Second iteration :

(v) Rule 2 fires : conclusion G is true

new knowledge found

(vi) Rule 4 fires : conclusion D is true

Goal found;

Proved

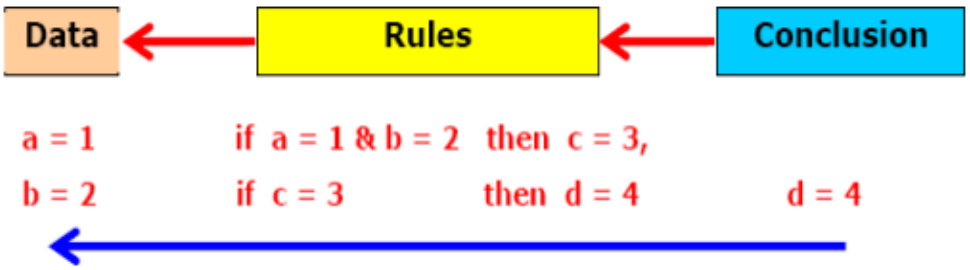
3.3.2 Backward Chaining Algorithm

Backward chaining is a techniques for drawing inferences from Rule base. Backward-chaining inference is often called goal driven.

‡ The algorithm proceeds from desired goal, adding new assertions found.

‡ A backward-chaining, system looks for the action in the THEN clause of the rules that matches the specified goal.

Goal Driven



Example : Backward Channing

■ Given : Rule base contains following Rule set

Rule 1: If A and C Then F

Rule 2: If A and E Then G

Rule 3: If B Then E

Rule 4: If G Then D

■ Problem : Prove

If A and B true Then D is true

Solution :

(i) Start with goal ie D is true

go backward/up till a rule "fires" is found.

First iteration :

(ii) Rule 4 fires :

new sub goal to prove G is true

go backward

(iii) Rule 2 "fires"; conclusion: A is true

new sub goal to prove E is true

go backward;

(iv) no other rule fires; end of first iteration.

new sub goal found at

(iii)go for second iteration

Second iteration :

(v) Rule 3 fires :

conclusion B is true (2nd input found)

both inputs A and B ascertained

Proved