CS 344
Artificial Intelligence

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Knowledge representation and inferencing in Predicate Calculus (PC)

- Precursor to planning
- Built in Prolog programming language

Himalayan club example

1. $member(A)$
2. $member(B)$
3. $member(C)$
4. $\forall x[member(x) \rightarrow (mc(x) \vee sk(x))]$
5. $\forall x[sk(x) \rightarrow lk(snow)]$
6. $\forall x[mc(x) \rightarrow \sim lk(rain)]$
7. $\forall x[\sim like(B,x) \rightarrow lk(A,x)]$
8. $\forall x[lk(B,x) \rightarrow \sim lk(A,x)]$
9. $lk(A,rain)$
10. $lk(A,snow)$
11. $\forall x[member(x) \wedge mc(x) \wedge \sim sk(x)]$

mc : mountain climber

sk : skier

lk : likes

Inferencing Algorithm

Resolution – Refutation

1. Negate the goal
2. Add the resulting expressions to the Knowledge Base
3. See if a contradiction results

Illustration

Through MP,

Given

1. P

2. $P \rightarrow Q$

3. Infer Q

<u>Forward Inferencing</u> (DATA DRIVEN)

a) Match *L.H.S*

b) Move forward over $\rightarrow$

c) Assert *R.H.S*

When done repeatedly this is called forward chaining.

Backward Chaining (GOAL DRIVEN)

a) Take the goal and match the *R.H.S* of a rule

b) Move backward over $\rightarrow$

c) Assert *L.H.S*

When done repeatedly this is called backward chaining

Example for,

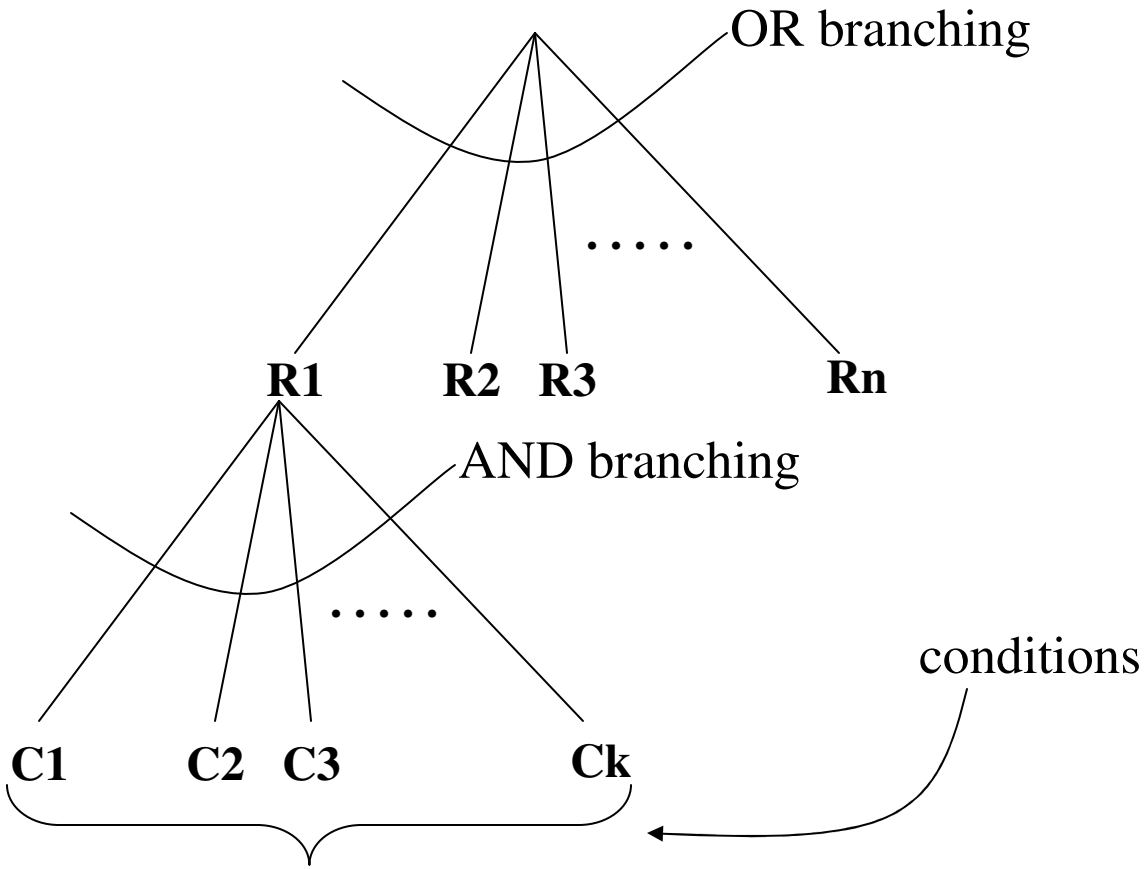
Forward inferencing - OPS5 (Used in design of computer systems)

Backward inferencing - MYCIN (Medical diagnosis)

- In general design expert systems follow forward chaining and diagnosis expert systems follow backward chaining

Some technical insights

- FWD/BKWD depends on the fan out factor of the rules and facts.



Assignment 2

- Develop a syntactic theorem prover in Hilbert's Propositional calculus system
  - Implement it in two methods
    1. Using deduction theorem
    2. Use the idea from completeness proof
  - Try to demostrate that human interference is required sometimes
- Submission is due in 15 days (i.e. 12th March)