Assignment No:- 02

Name :- Tushar Shailesh Bhosale

Roll No :- 10

Class :- B.E. I.T

Sem :- VII

Sub :- IS lab.

DOP	DOC	Marks	Sign.

Assiyoment NO :- 02

Q.1] Solve the following with forward chaining or backword chaining or resolution (any one) use predicate logic as language of knowldege representation clearly specify the facts and inference rule used.

Q.1) Example:

1) Every child sees some witch No which has both a black cat and a pointed hat.
2) Every witch is good or bad
3) Every child who sees any good with gets condy
4) Every witch that is bad has a black cat.
5) Every witch that is seen by any child has a pointed hat.
6) Prove : Every child gets condy

→ A) Facts into FOL

1) ∃xAy (child (x), witch(y) → sees (x,y))
 ∧∃y (witch (y) → has(y, black cat) ∧ has (y. pointed hat)
2) ∃y (witch(y) → good (y) ∨bad(y))
3) Ex ((sees (x, y) → (witch(y) → good(y)) → get (x, condy)
4) Ey ((witch (y) → bad(y)) → has (y→ black hat))
5) ey (sees (x,y) → has (y, pointed hat)

B) Fol into CNF

1) ∃xAy(child (x), witch(y) → sees (x,y))
→ ∧ ∃y, (witch(y) → has (y, black hat)
→ ∧ ∃y (witch (y) → has (y, pointed hat)

2) ∀y (witch (y) → good (y))
∀y [witch (y) → bad (y))
3) ∃x ((sees (x,y) → witch (y) → good(y)) → gets [x, candy)
→ ∃x [(sees [x,y) → witch (y) → good (y)) → (x candy)
4) ∀y [bad (y) → has (y, black hats)]
5) ∀x [seen (x,y) → has (y, pointed hat)]
6) ⇒ ¬∀x [seen (x,y) → has (y, black hat)]

c)

sees (x,y)   witch(y) ∨ sees (x,y)
{good ∨ bad/y}

¬seen (x,(good) ∧ sees (x,bad)   has (y,z)
{y/good ∨ bad}
{z/black cat ∨ pointed hat}

seen (x, good) ∨ seen (x, bad)   has(good, pointed hats ∨ get(x, candy))

seen (x, good) ∨ has (good, pointed hat) ∨ gets (x, candy)   seen (x, good) ∨ gets (x, candy)

gets (x, candy)   gets (x, candy)

2) ~~3)~~ Example 2 :-

1) Every boy or girl is a chid
2) Every child gets a doll or a train or a tump of a coal
3) No boy gets any doll.
4) Every child who is bad gets any lump of coal
5) No child gets a train
6) Ram gets lump of coal.
7) prove Ram is bad.

→ 1) ∀x(boy(x) or girl(x) → child (x))
2) ∀y (child(y) → gets (y, doll) or gets (y, train) or gets (y, coal))
3) ∀ w(boy (w) → ! gets (w, doll)
4) for all z(child(z) and bad(z)) → gets (z, cool)
∀y child(y) → ! gets (y, train)
5) child (ram) → gets (ram, cool)
To prove(child ram) → bad(ram)

CNF clauses
1) ! boy (x) or child (x)
! girl (x) or child(x)
2) ! child (y) or gets (y, doll) or gets (y, train) or gets (y ; coal)
3) ! boy (w) or ! gets (w, doll)
4) ! child (z) or ! bad (z) or gets (z, coal)
5) ! child (ram) → gets (ram, coal)
6) bad (ram)

Resolution :-

4) ! child (z) or ! bud (z) or get (z, coal)
6) bud (rum)
7) ! child (rum) or gets (rum, coal)
substituting z by rum
1) (a) ! boy (x) or child (x)
boy (rum)
8) child ram (substituting x by rum)
7) ! child (rum) or gets (rum, coal)
8) child (rum)
9) gets (rum, coal)
2) ! child (y) (or gets (y, doll) or gets (y, train) or
gets (y, coal)
8) child (rum)
10) gets (rum, doll) or gets (rum, train) or gets
(rum, coal)
(substituting y by rum)
9) gets (rum, coal)
10) gets (rum, doll) or gets (rum, coal) or gets
(rum, coal)
11) gets (rum, doll) or gets (rum, coal)
3) ! boy (w) or ! gets (w, doll)
5) boy (rum)
12) ! get (rum, doll) (substituting w by rum)
11) gets (rum, doll)
13) gets (rum, coal)
6) (a) get (rum, coal)
13) gets (rum, coal)
Hence, bud (rum) is proved.

Q.2) Differentiate between STRIPs and ADL

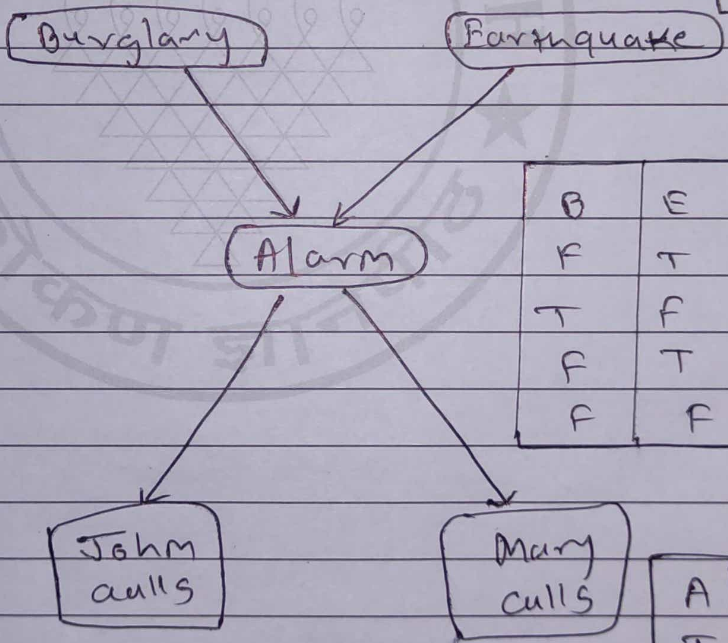
STRIPs language	ADL
1) only allow positive literals in the states for eg: A valid sentence is STRIPs is Expressed as => Intelligents ^ Beautiful	1) Can support both positive and negative literals. for eg :- Same sentence is expressed as => Stupid ^-ugly
2) STRIPs stand for Stan-dard Research Instimde problem solver	2) Stands for Action Description Language
3) makes use of closed world assumption (i.e) un mentioned literals are false	3) Makes use of open world Assumption (i.e) unmentioned literals are unknown
4) we only can find ground literals in goals. for eg :- Intelligent ^ Beautiful	4) we can find qualified variables in goal. for eg :- $\exists x$ At(P1 x) ^ At (P2 , x) is the goal of having P1 and P2 in the example of block.
5) Goals are conjuctions for eg :- (Intelligent ^ Beautiful)	5) Goals may involve conjunctions & disjunctions for eg :- (Intelligent ^ (Beautiful ^ Rich))

6) Effects are conjunctions	6) conditional effects are allowed: when P:E means E is an effect only if P is satisfied
7) Does not support equality	7) Equality predicate (x=y) is build in
8) Does not have support for types	8) Support for types for eg: The variable P: Person.

Q4) You have two neighbors J and M, who have promised to call you at work when they hear the alarm. J always calls when he hears the alarm, but sometimes confused telephone ringing with alarms and calls then too. M likes loud with music and sometimes misses the alarm together. Given the evidence of who has or has not called we would like to estimate the probability of burglary. Draw a Bayesian network for this domain with suitable propobility table.

P(B)
0.001

P(E)
0.002



B	E	P(A)
F	T	0.95
T	F	0.94
F	T	0.29
F	F	0.001

A	P(J)
T	0.09
F	0.05

A	P(M)
T	0.70
F	0.01

1) The topology of the network indicates that Burglary and earthquake affect the probability.

of the alarms going off.

- whenever John and mary call depends only on alarm
- They do not perceive any burglaries directly they do not notice minor earthquakes and they do not confer before calling

2) mary listening to loud music and John confusing phone ringing to sound of alarm can be read from network only implicitly an uncertainty associated to calling at work.

3) In probability actually summarize potentially infinite sets of circumstances

- The alarm might fail to go off due to high humidity, power failure, dead battery, cut, wires a dead mouse stuck inside the bell etc.
- John and mary might fail to call and report and alarm because they are out to. lunch, on vacation temporarily dead passing helicopter etc.

4) The condition probability tables in n/w gives probability for values of random variables depending on combination of values for the parent nodes.

5) Each row must be sum To 1 because entries represent exhaustive set of cases for variable

6) All variables are Boolean.

7) In general a table for a Boolean variable with k parents contain 2^k independently specific probabilities.

8) A variable with no parents has only one row representing prior probabilities of each possible value of the variable.

9) Every entry in full joint probability distribution can be calculated from information in Bayessian network.

10) A generic entry in joint distribution is probability of a conjuction of particular assignments to each variable $P(X_1 = x_1 \wedge \ldots \wedge \ldots X_n = x_n)$ abbreviated as $P(x_1, \ldots, x_n)$.

11) The value of this entry is $P(x_1, \ldots x_n)$ $= \Pi_i - 1, nP(1, \text{parents}(x_i))$, where parents (x_i) denotes the specific values of the variables Parents (x_i)

$- P(j \wedge m \wedge a \wedge \neg b \wedge \neg e)$

$= P(j|a)\, P(m|a)\, P(a|\neg b \wedge \neg e)\, P(\neg b)\, e(\neg e)$

$\Rightarrow 0.09 \times 0.07 \times 0.001 \times 0.999 \times 0.998$

$\Rightarrow 0.000628$

12) Bayesian Network