Assignment No :- 2

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Subject :- IS Lab

D.O.P	D.O.A	Remark	Sign.

Assignment NO:- 2.

Q.1. Solve the following with forward Chaining or backword Chaining or resolution (any one) w.use Predicate logic as language of knowledge representation ~~Clo~~ clearly specify the Facts and interence rule used.

Q.1. Example 1

1) Every Child Sees Some witch No ~~wh~~ witch has both a black cat and a pointed hat

2) Every with is good or band

3) Every Child who sees any good witch gets Candy.

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 candy.

→ A) Facts into Fol.

1) $\exists x A y$ (Child (x) , withh (y) → Sees (x , y))
$\sim \exists$ y (witch (y) → has (y, black cat) ^ has (y, Pointed , hat)

2) $\exists$ y (witch (y) → good (y) v bad (y))

3) E x ((sees (x, y) → (witch (y) → good (y)) → get (x, candy)

4) E y ((withh y) → bad (y)) → has (y → black hat))

5) E y (Sees (x, y) → has (y, Pointed hat)

b) FOL into CNF

1) ∃x ∀y (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 [(ses (x, good(y) → gets (x, candy)]

4) ∃y (band (y) → has (y, black, hats)]

5) ∃y [seen (x,y) → has (y, Pointed hat)]
→ ~∀y [seen (x,y) → has (y, black hat)]

c)

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

~ seen (x, (good) ∧ sees (x, band)   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 2) Example 2:

1) Every boy or girl is a child
2) Every child gets a doll or a train or a lump 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, coal)
∀y child (y) → ! gets (y, train)
5) child (ram) → gets (ram, coal)
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, oral)
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 ! bad (z) or get (z, Coal)
6) bad (ram)
7) ! child (ram) or gets (ram, Coal)
Substting z by ram
1) (a) ! boy (x) or Child (x)
boy (ram)
8) Child ram (substting x by ram)
7) ! child (ram) or gets (ram, Coal)
8) child (ram)
9) gets (ram, coal)
2) ! child (y) (or gets (y, doll) or gets (y, train)
or gets (y, coal)
8) child (ram)
10) gets (ram, doll) or gets (ram, train) or
gets (ram, Coal)
(Substituting y by ram)
9) gets (ram, Coal)
10) gets (ram, doll) or gets (ram, train) or
gets (ram, coal)
(Substituting y by ram)
9) gets (ram, coal)
10) gets (ram, doll) or gets (ram, train) or
gets (ram, coal)
11) gets (ram, doll) or gets (ram, Coal)
3) ! boy (w) or ! gets (w, doll)
5) boy (ram)
12) ! get (ram, doll) (substituting w by ram)

11) gets (ram, doll) or gets (ram, train)
12) ¬ gets (ram, doll)
13) gets (ram, coal)
6) <a> get (ram, coal)
13) gets (ram, coal)
Hence, bad (ram is proved

Q.2. Differente 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 → Intellight ∧ Beoutiful	1) Can support both possitive and negative literals. for eg:- Same Sentence is expressed as ⇒ Stupid ∧ - ugly.
2) STRIPS stand For. Standard Research Institute Problem Solver	2) Stands For action Description language
3) Makes use of Closed world assumption (i.e) un mentioned literals are False.	3) Make use of open world Assumption (i.e) unmentioned literals are unknown

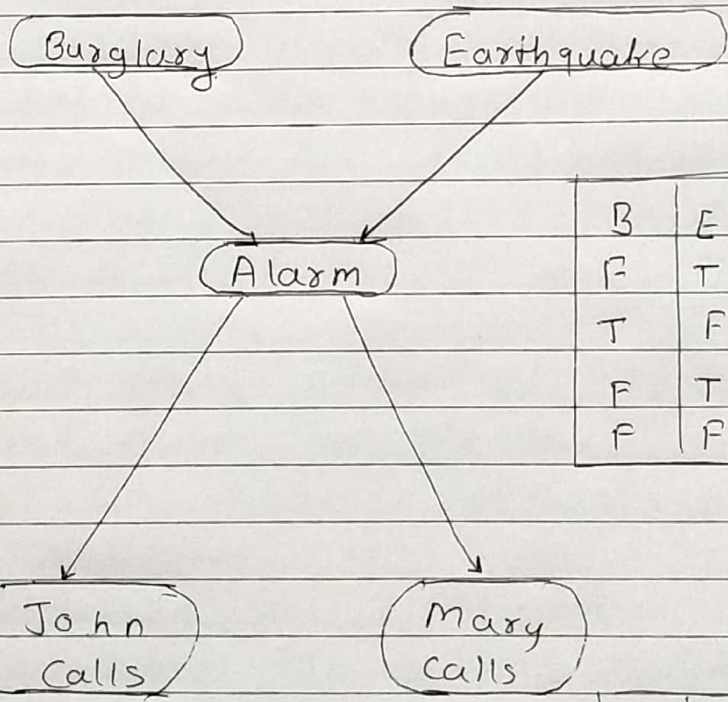
4) we only Can Find ground literals in goals For. eg:- Intelligent ^ Beautiful	4) we Can find qualified Variables in goal For eg (∃x At (P1 x) ^ At (P2, x) is the goal of having P1 & P2 in the some place in the example of blocks.
5) Goals are conjuctions For eg:- (Intelligent ^ Beautiful	5) Goals may involve Conjunction and 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 satified
7) Does not support equality	7) Equality Predicate (x = y) is build in
8) ~~Dose~~ Does not have support For types	8) Support for types For eg:- The Variable P : Person

Q.4 You have two neighbors J and M, who have promised to call you at work when they here the alarm. J always calls when he hears the alarm but sometimes confused telephone ringing with alarms and calls then too M likes loud music and somethimes misses the alarm together Given the evidence of who has or has not called we would like to estimare the probability of burglary. Draw a Bayes'an networks for this domain with suitable probability 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
E	0.05

A	P(M)
T	0.70
F	0.01

1) The topology of the network indicats that
- Burglary and earthquate affect the Proba-
-bility of the alarms going off.
→ whether John and mary call depends only
On aram.
- They do not pereive any burglaries
directly they do not notice minor eartha-
-quates and they do not Confer before Calling
2) many listenting to loud music and John
Confusing phone ringing to sound of alarm
Can be read from network only implicity
as uncertainly associated to calling at
work.
3) The Probability actually summarize potentally
infinite set of circumstances.
- The alarm might full to go off due to.
high humidity, Power failure, dead batttery,
Cut, wires a dead mouse stuck inside the
bell etc.
4) John and many might Fail to call and
report and alarm because they are out
to lunch, an vacation, temporarily deaf.
Passing helicopter etc.
4) The Condition Probability tables in network
gives probability for values of random
Variables depending, an 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 varible are Boolean.

7) ~~A~~ In general, a table for a Boolean varible with k Parents Contains 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 calcuted from information in Bayessian network.

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

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

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

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

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

$= 0.000628$

12) Bayesion Network.