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Subject :- IS LAB

Class :- B.E. I.T

DOP DOA Remark Sign

Q1] Solve the following with forward chaining or backward chaining or resolution we predicate logic as language of knowledge represenation clearly specify the facts and inference rule used.

Example 1:

1) Every child specs some which no which has both a black cat & a pointed hat.
2) Every witch is good or bad
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) $\exists x \forall x$ (child (x), witch (y) $\rightarrow$ sees (x, y))
$\sim \exists y$ (witch (y) $\rightarrow$ has (y, black cat) $\wedge$ has (y, pointed hat)
2) $\exists y$ (witch (y) $\rightarrow$ good (y) $\vee$ bad (y))
3) Ex ((sees (x, y) $\rightarrow$ (witch (y) $\vee$ bad (y)) get (x, candy)
4) Ey ((witch (y) $\rightarrow$ bad (y)) $\rightarrow$ has (y $\rightarrow$ black cat)
5) Ey (sees (x, y) $\rightarrow$ has (y, pointed hat)

B) FOL into CNF

1) $\exists x \forall x$ (child (x), witch (y) $\rightarrow$ sees (x, y))
2) $\rightarrow \sim \exists y$, (witch (y) $\rightarrow$ has (y, black cat)
$\rightarrow \sim \exists y$ (witch (y) $\rightarrow$ has (y, pointed hat)
2) $\forall y$ (witch (y) $\rightarrow$ good (y))
$\forall y$ (witch (y) $\rightarrow$ bad (y))
3) Ex [(sees (x, y) $\rightarrow$ witch (y) $\rightarrow$ good (y) $\rightarrow$ gets (x, and y)

→ Ex[(sees(x, good(y)) → gets(x, candy)]

4) Ey[bad(y) → has(y, black hats)]

5) Ey[seen(x, y) → has(y, pointed hat]

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

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

~seen(x, (good) ∧ sees(x, bad)) has(y, z)
[y/good v bad}
{z/black cat v
pointed hat)}

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

Seen(x, good) v has(good,
pointed hat) v gets
(x, candy) seen(x, good) v
gets(x, candy)

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

Example 2:

1) Every boy or girl is a child.
2) Every child gets a doll or a train or a lump of coal.
3) No boy get any doll
4) Every child who is bad get 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)) → get (z, coal))
∀y child (y) → ! gets (y, train)
5) child (ram) → get (ram, coal)
To prove (child (ram) → bad (ram)).

CNF clauses
1) ! boy (x) or child (x)
! girl (x) or child (x)
2) ! chid (y) or get (y, doll) or gets (y, train) or gets (y, coal)
3) ! boy (w) or ! get (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, goal)

6) bad (ram)

7) ! Child (from) or gets (ram, coal)

Substituting z by ram

1) (a) ! boy (x) or child (x) boy rom

8) Child ram (substituting x by ram)

7) ! child (ram) or gets (ram, coal)

8) Child (ram)

9) gets (ram, coal)

10) ! child (y) (or gets (y, doll) or gets (y, train] or gets (y, coal)

7) Child (ram)

10) get (ram, doll) or get (ram, train) or get (ram, coal)

11) get (ram, doll) or get (ram, coal)

3) ! boy (w) or ! get (w, doll)

5) boy (ram)

12) ! get (ram, doll) substituting w by ram)

11) gets (ram, doll) or gets (ram, train)

13) ! get (ram, doll)

12) gets (ram, coal)

6) <a> get (ram, coal)

13) gets (ram, coal)

Hence, bad (ram) is proved.

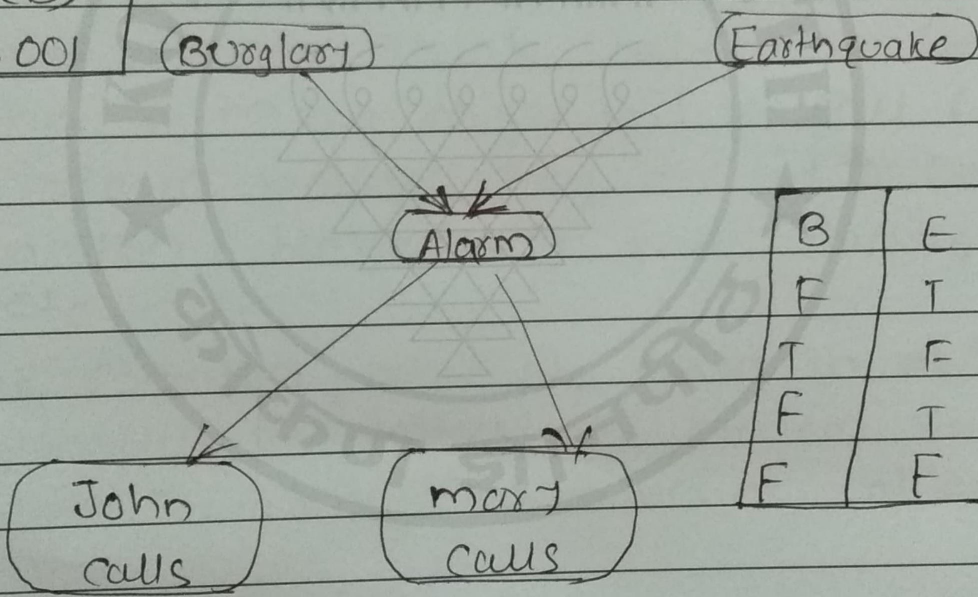
Q2 Differentiate between STRIPS and ADL

Strips Language	ADL
① Only allow positive literals in the states. for e.g. A valid sentence is STRIPS is expressed as ⇒ Intelligent ∧ Beatiful	① Can support both positive & negative literals for eg. :- Same sentence is expressed as ⇒ Stupid ∧ ¬ ugly
② STRIPS stands for Standard Research Institute Problem solver	② Stand for Actions 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 e.g.:- Intelligent ∧ Beautiful	④ We can find qualified variables in goal. for eg. :- $\exists x\, At(P_1, x) \wedge At(P_2, x)$ is the goal of having P_1 & P_2 in the same place in e.g. of blocks
⑤ Goals are conjunctions for e.g. :- (Intelligent ∧ beautiful)	⑤ Goals may involves conjunction & disjunctions for. e.g. :- (Intelligent ∧ (Beautiful ∧ Rich))

Q4 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. & calls then too M likes loud music & 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 ~~table~~. 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
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.

- Wheather John & mary call depends only on alarm.

- The alarm, dead ... stuck inside ... call
power failure, dead mouse
- John & mary might fail to call & alarm because they are out to lunch an vacation, temporarily deaf, passing helicopter etc.

4) The condition probability tables in n/w 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 variables are Boolean.
7) In general, a table for a Boolean variable 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 calculated from information in Bayessian network.

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

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

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

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

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

$= 0.000628$

12) Bayesian Network.