Assignment No :- 02

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DoP	DoA	Sign	Remarks

STANDARD
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Q1 Solve the following with forward chaining or backward chaining or resolution use predicate logic as language of knowledge representation clearly specify the facts & inference rule used.

Q1 Example 1:

1> Every child sees some witch. No witch has both black cat & a pointed hat.

2> Every witch is good or bad

3> Every child who sees only good witch gets candy

4> Every witch that is bad has black cat

5> Every witch that seen by any child has a pointed hat.

6> Prove. Every child gets candy

⇒ A> facts into FOL

1> ∃ x ∀y (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)7 → (witch (y) → good (y)) → get (x, candy)

4> Ey ((witch (y) → bed (y)) → has (y ⇒ black hat)))

5> EY(sees(x, y) → has (y, pointed hat)

B> FOL into CNF

1> ∃ x ∀y (child (x), witch (y) ⇒ sees (x, y))
→ ~ ∃x , (witch(y) → has(y, black hat))
→ ~ ∃Y (withc (y) → has (y, pointed hat)

2> $\forall Y(witch(y) \rightarrow good(y))$

$\forall Y(witch(y) \rightarrow bad(y))$

3> $\exists X[((Sees(x, y) \rightarrow witch(y) \rightarrow good(y))) \rightarrow gets(x, candy)$

$\Rightarrow \exists X[[Sees(x, good\ y) \rightarrow gets(x, candy))]$

4> $\exists Y[bad(y) \Rightarrow has(y, black\ hats)]$

5> $\exists Y[Seen(x, y) \Rightarrow has(y. pointed\ hat))]$

$\Rightarrow \sim\forall Y[Seen(x, y) - has(y, black\ hat)]$

6>

$Sees(x, Y]$ | $witch(y) \vee Sees(x, y]$ $\{good \vee badly\}$

$\sim Seen[x, (good) \wedge Sees(x, bad)$ | $has(Y, z)$ $\{y/good \vee bad\}$ $\{z/black\ Cat \vee pointed\ hat\}$

$Seen(x, good) \vee has(good\ point\ hat) \vee gets(x, candy)$ | $Seen(x, good) \vee Gets(x, candy)$

$gets(x, candy)$ | $gets(x, candy)$

Example 2:

1> Every boy or girl is a child
2> Every child gets a doll or a train or a lump of a coal
3> No boy gets any doll
4> Every child ~~gets~~ who is bad gets any lump of coal
5> No child gets 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) & 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, ~~t~~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 ! bad (z) or gets (z, coal)

6) bad (ram)

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

Substituting z by ram

1 (a) ! boy (x) or gets child (x) boy (ram)

8 child ram / Substituting x by ram)

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

8 child (ram)

9 gets (ram, coal)

10 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)

12 ! gets (ram, doll)

13 gets (ram, coal)

6 (a) get (ram, coal)

13 gets (ram, coal)

Hence, bad (ram is proved

Q2 Differentiate between STRIPS & ADL

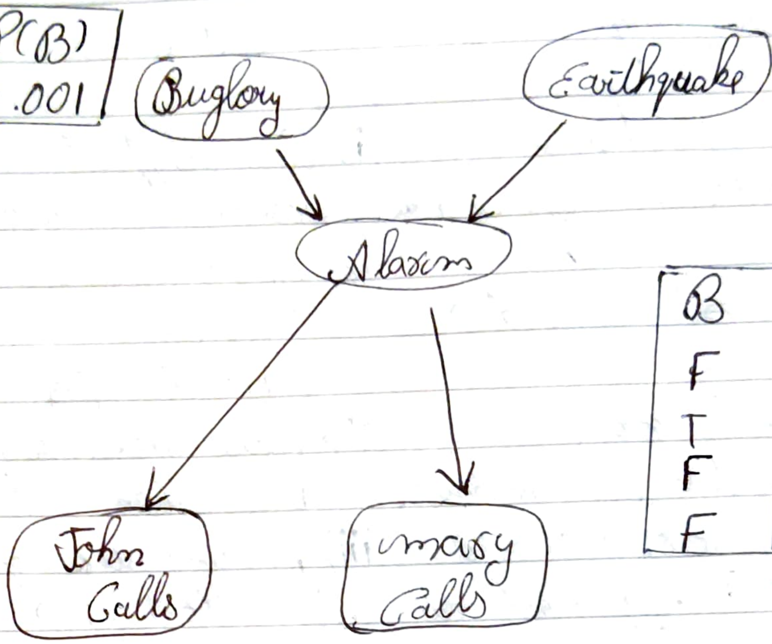
STRIPS Language	ADL
i> Only allow positive literals in the states for eg: A valid Sentence is STRIPS is expressed as ⇒ Intelligent ∧ Beautiful	i> Can Support both positive & negative literals for eg:- Same Sentence is expressed as ⇒ Stupid ∧ - ugly
ii> STRIPS Stands for Standard Research Institute Problem Solver	ii> ADL Stands for Action Description Language
iii> make use of closed world assumptions (i.e) unmentioned literals are false	iii> makes use of open world Assumptions (i.e) unmentioned literals are unknown
iv> We only can find grounded literals in goals for eg: Intelligent ∧ Beautiful	iv> We can find qualified variables in ~~goal~~ goal.
v> Goals are Conjunctions for eg:- Intelligent ∧ Beautiful	v> Goals may ~~increases~~ involve Conjunction disjunction for eg:- (Intelligent ∧ (Beautiful ∧ Rich)
vi> Effects are conjunctions	vi> Conditional effects are allowed: when P.E means E is an effect only if P is Satisfied
vii> Does not Support Equality	vii> Equality predicate (x = y) is build in
viii> Does not have Support for types	8> Support for types for eg: The variables P: Person

Q4 You have two neighbours ...... 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

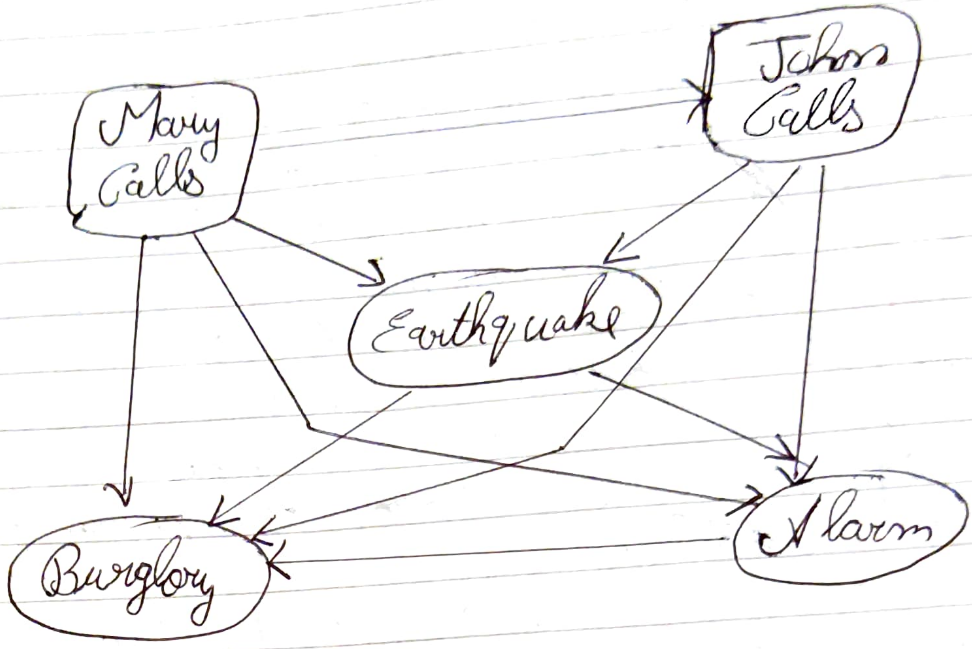
A	P(J)
T	0.09
F	0.05

A	P(M)
T	0.70
F	0.01

① The topology of the network indicates that
- Buglary and earthquake affect the probability of the alarm going off
- whether Jhon and Mary call depends only ~~tw~~ on alarm
- They do not perceive any burglaries directly - they do not notice minor earthquake and they do not confer before calling

② Mary listening to loud music & Jhon confusing phone ringing to sound of alarm can be read from network only implicity as uncertainly associated to calling at work

③ The probablity actually summarize potentially infinite sets of circumstances
- The alarm might fail to go off due to high humidity, battery dead etc.
- Jhon and many might fail to call report of alarm because the are out to lunch etc.
④ The condition probablity tables in n/w gives probablity for values of random variables depending on combination of values for the parent nodes.
⑤ Each row must be sum to 1, because entries ~~reported~~ represented exhastive set of cases for variables.
6> All variables are Boolean
7> Every entity in fully joint probablity distribution can be calculated from information in Bayession network.
8> A generic entity in joint distribution is probablity of a conjunction of particular assignments to each variable $P(x_1, \ldots x_n)$
9> The value of the entry is $P(x_1, \ldots x_n) =$ $\Pi i-1, n P(1, Parents(Xi))$, where parents $S(x_i)$ denotes the specific values of the variables parents (Xi)
- ~~$P(j|a)$~~
- $P(j \wedge m \wedge a \wedge \sim b \wedge \sim e)$
$= P(j|a) P(m|a) P(a|\sim b \wedge \sim e) P(\sim b) P(\sim e)$
$= 0.99 \times 0.07 \times 0.001 \times 0.999 \times 0.998$
$= 0.000628$
10> Bayesion Network.


Mary Calls
John Calls
Earthquake
Burglory
Alarm