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Assignment No. 2

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

1) Example 1:-
1. Every child ~~has~~sees some witch NO witch has both a black cat & a pointed hat.
2. Every witch is good or bad.
3. Every child who sees any good with gets candy.
4. Every with that is bad has a black cat.
5. Every with that is 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 (which (y) → good (y) ∨ bad (y))
3) ∃x ((sees (x, y) → (witch (y) → good(y)) → get (x, candy))
4) ∃y ((witch (y) → bad (y)) → has (y → black hat))
5) ∃y (sees (x, y) → has (y, pointed hat)

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B] FOL into CNF

1) $\exists x \forall y$ (child (x), witch (y) $\rightarrow$ sees (x, y))
$\rightarrow \sim \exists y$, (witch (y) $\rightarrow$ has (y, black hat)
$\rightarrow \sim \exists y$ (witch (y) $\rightarrow$ has (y, pointed hat)

2) $\forall y$ (witch (y) $\rightarrow$ good (y))
$\forall y$ (witch (y) $\rightarrow$ bad (y))

3) $\exists x$ [(sees (x, y) $\rightarrow$ witch (y) $\rightarrow$ 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) $\rightarrow$ has [y, black hat]]

C]

sees (x, y)

witch (y) $\vee$ sees (x, y)
{ good $\vee$ bad (y}

$\sim$seen (x, (good) $\wedge$ sees (x, bad)

has (y, z)
{ y/good $\vee$ bad
{ z/black cat
$\vee$ pointed hat)}

seen (x, good) $\vee$ seen (x, bad)

has (good, pointed
hats $\vee$ get (x, candy

seen (x, good) $\vee$ has (good,
pointed hat) $\vee$ gets (x, candy)

seen (x, good)
get (x, candy)

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2) Example 2:

1) Every boy or girl is a child
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 jump 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 (y, train)
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, coal)
3) ! boy (w) or ! gets (w, doll)
4) ! child (z) or ! bad (z) or gets (z, coal)

5) bad (ram).

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4) ! child (z) or ! bad (z) or get (z, coal)
6) bad (ram)
7) ! child (ram) or gets (ram, coal)
substituting z by ram
1) (a) , ! boy (x) or 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)
2) ! child (y) (or gets (y, doll) or gets (y, train) or gets (y, coal)
8) child (ram)
10) get (ram, doll) or gets (ram, train) or gets (ram, coal)

9) gets (ram, coal)
10) gets (ram, doll) or gets (ram, train) or gets (ram, coal)
3) ! boy (w) or ! gets (w, doll)
5) boy (ram)
11) gets (ram, doll) or get [ram, train]
12) ! gets (ram, doll)
13) gets (ram, coal)
6) (a) get (ram, coal)

13) gets (ram, coal)
Hence, bad (ram) is proved.

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Q.2 Differentiate betn STRIPS & ADL.

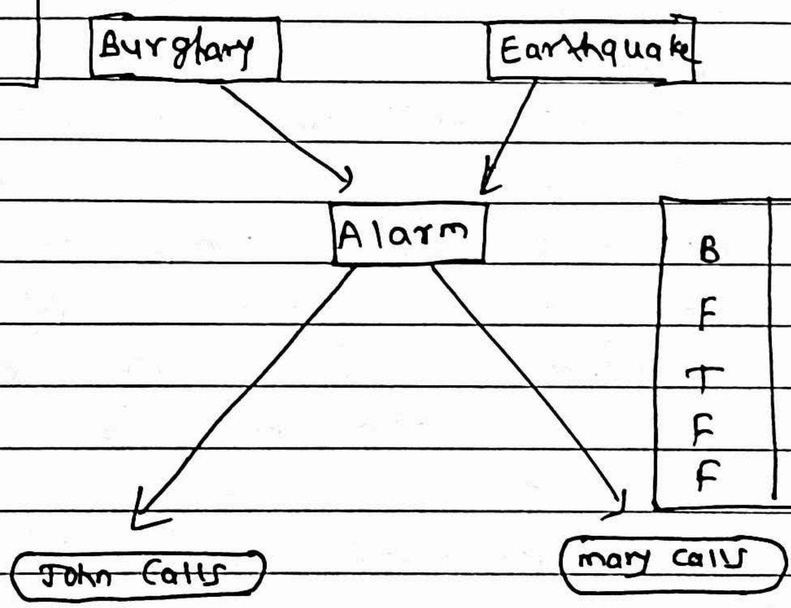
STRIPS language	ADL
① Only allow positive literals in the states for eg : A valid sentence is STRIPS is expressed as → Intelligent ^ Beautiful.	① can support both positive & negative literals. for eg :- same sentence is expressed as → stupid ^ - ugly.
② STRIPS stand for standard Reasearch Institute problem solve	② stands for Action Description Language
③ makes use of closed world assumption (i.e.) an 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.	④ we can find qualified variables in goals.
⑤ Goals are conjunctions. for eg :- (Intelligent ^ Beautiful)	⑤ Goals may involve conjunctions & disjunctions for eg :- Intelligent ∧ Beautiful)

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 & calls then too M like loud music & sometimes misses the alarm together.

→

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 & earthquake affect the probality of the alarms going off.

- They do not perceive any burlaries directly. ~~&~~ they do not notice minor earth quakes and they do not confer before calling.

2) mary listening to loud music & John confusing phone ringing to sound of alarm can be read from networks only implicitly as uncertainly associated to calling at work.

3) The probality actually summarize potentially infinite sets of circumstances.

- The alarm might full to go off due to ~~&~~ high humidity, power failure, dead battery, cut wires, a dead mouse stuck inside the bell, etc.

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

5) Each row must be sum to 1, because entries represent exhasive set of cases for variables.

6) All variables are ~~Bo~~ Boolean.

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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, = x, ∧ -- ∧

11) The value of this entry is P(x1 --- xn) = Πi-1 , nP (1, parents (xi)), where parents s (xi) denotes the specific values of the variable parent (xi)
= P (j ∧ m ∧ a ∧ ¬b ∧ ¬e)
= P(j|a) P (m|a) P (a|¬b∧¬e) P(¬b)P(¬e)
= 0.09 × 0.07 × 0.001 × 0.999 × 0.998
= 0.000628

12) Bayesian Network.