Assignment No. 2

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Subject : IS LAB

DOP	DOA	Marks	Sign

Q.1) Example 1:

1) Every child 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 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) ∃ 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) ∈ 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)

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) Ex [(sees (x, y) → witch (y) → good (y)) → gets (x, candy
→ 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) ∨ 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) 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, 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, coal)

6) bad (ram)

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

Substituting z by ram.

8) (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).

7) child (ram)

10) gets (ram, doll) or gets (ram, train) or gets (ram, coal).

(substituting y by ram)

9) gets (ram, coal).

11) get (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) Different between STRIPS land ADL

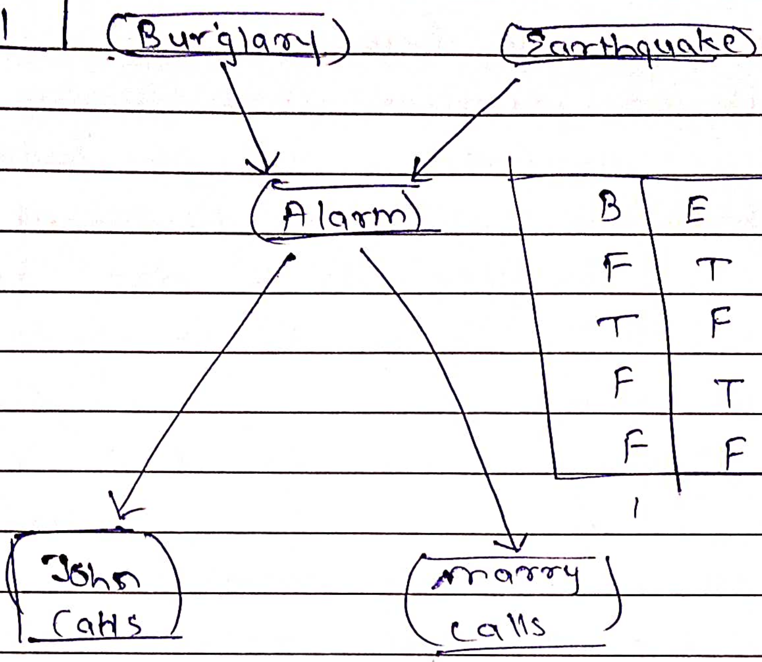
STRIPS language	ADL.
1) only allow positive literals in the states. for eg. A valid sentences is STRIPS is expressed as → Intelligent ^ Beautiful.	Can support both positive & negative literals. for eg: Some sentences is expressed as → stupid ^ - ugly
2) STRIPS stands for Standard Research Institute Problem Solver.	Stands for Action Description language.
3) makes use of closed world assumption (i.e.) an mentioned literals are false.	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.	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 the examples of blocks.

5)	Goals are conjunctions for eg. (Intelligent ∧ Beatiful)	Goals may increase involve conjunctions & disjunctions for eg :- (Intelliget ∧ (Beautiful ∧ Rich))
6)	Effects are conjuctions.	Conditional effects or allowed when P:E mean E is an effect only P is satisfied.
7)	Does not support equality	Equality predimate (x=y) is build in.
8)	Does not have support for types	Support for types for eg : The variable : P : person.

Q. 4]
→

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
- Burglory and earchquake affect the probability of the alarms going off.
- wheather John and marry call depends only on alarm.
- They do not perceive any burglaries directly they do not notice minor earchquage 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 network only implicity as uncertainly associated to calling at work.

3) The 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 a alarm because they are out to lunch, on vacation, temporarily deaf, passing helicopter etc.

4) The condition probability tables in cpt 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 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 Bayession 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 $p(x) \dots x_n) = \pi i - 1,$ $n\, p(1, \text{parents}(xi))$, where parents $S(xi)$ donates the specific values of the variables parents $(xi]$

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

$= p(j|a)\ p(m|a)\ p(a|\sim b \wedge \sim e)\ p(\sim b)\ e(\sim e)$

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

$= 0.000628$

12) Bayesian Network.