Assignment -2

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DOP	DOC	Marks	Sign

Q1. Solve the following with forward chaining or backward chaining or resolution we predicate logic as language of knowledge representation 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) ∃xAy (child(x), witch(y) → sees(x,y))

~∃y (witch(y) → has (y, black cat) ∧ has (y, pointed hat)

2) ∃y (witch(y) → good(y) v bad(y))

3) Ex ((sees(x,y) → (witch(y) v bad(y)) get (x, candy)

4) Ey ((witch(y) → bad(y)) → has (y → black hat)

5) Ey (~~s~~sees (x,y) → has (y, pointed hat)

B) FOL into CNF

1) ∃xAy (child(x), witch(y) → sees(x,y))

2) → ~∃y, (widh(y) → has (y, black cat)

→ ~∃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) 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)   gets (x, candy)

Example 2 :

1) Every boy or girl is a ~~ø~~ child.

2) Every child gets a doll or a train or a lump of 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 girld (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) ! chld (y) or gets (y, doll) or gets (y, train) or gets (y, coal)
3) ! cboy (w) or ! gets (w, doll)
4) ! child (z) or ! bad (z) or gets (z, coal)
5) ! child (ram) → gets (ram, coal)
6) bad (ram)

Resolation
4) ! child (2) 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 ram
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) gets (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)
11) gets (ram, doll) or gets (ram, coal)
3) ! boy (ω) or ! gets (ω, doll)
5) boy (ram)
12) ! get (ram, doll) substituting ω by ram)
11) gets (ram, doll) or gets (ram, train)
13) ! gets (ram, doll)
12) gets (ram, coal)
6) (a) get (ram, coal)
13) gets (ram, coal)
Hence, bad (ram) is proved.

FOR EDUCATIONAL USE

Q.2) Differentiate between STRIPS and ADL.

→

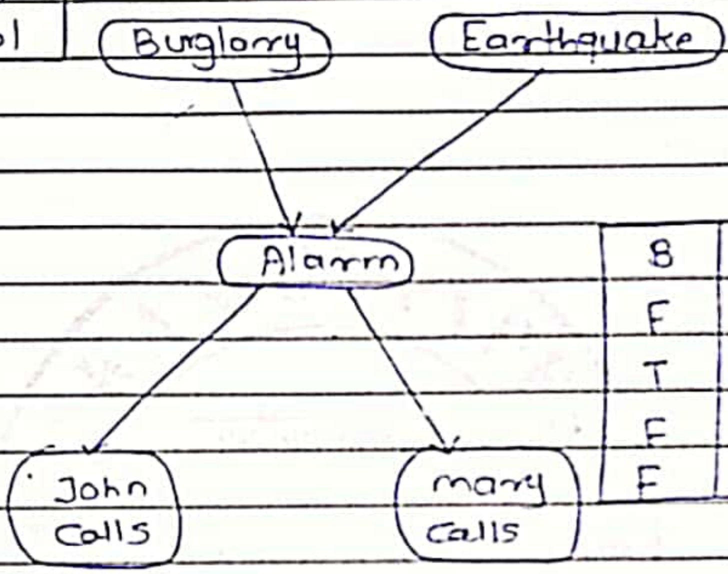
	STRIPS language	ADL
1)	Only allows positive literals in the states.	Can support both positive & negative literals.
2)	STRIPS stand for standard Research Institute problem solver.	stands for action Description language.
3)	we only can find ground literals in goals.	we can find qualified Variables in goal.
4)	makes use of closed world assumption unmentioned literals are false.	makes use of open world assumption unmentioned literals are unknown.
5)	Goals are Conjunctions for eg: (intelligent ∧ beautiful)	Goals may involve Conjunction for eg. (inteligent ∧ (beautiful ∧ rich)
6)	Does not support equality.	equality predicate $(x=y)$ is build in.

Q.4) →

You have two neighbours

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 n/w indicates that
- Burglary & earthquake affect the probability of the alarms going off.
- whether John & mary call depends alarm.
- They do not perceive any burglaries directly. They do not notice minor earthquakes & they do not confer before calling.

2) Mary listening to loud music & John Confusing phone ringing to sound of alarm can be read from n/w only implicity as uncertainly associated to calling at work.

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

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

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

5) Each row must be sum to 1 because entries represents exhaustive set of values for the variables.

6) all variables are boolean.

7) In general, a table for a boolean variable with k parents contains 2^k ~~in~~ independently specific probabilities.

8) A variable with no parents has only one row, representing prior probabilities of each posibility value of the variable.

9) every entry in ~~joint~~ full joint probability distribution can be calculated from info. in bayession n/w.

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

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

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

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

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

$= 0.000628$

12 Bayesian n/w: