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Batch : I3

SEM : 7/I.T.

SUBJECT : IS LAB.

DOP	DOA	REMARK	SIGN

ASSIGNMENT : 2

Q. 1>

Example 1

→

A) Facts into FOL

1> $\exists x \forall y$ (child (x), witch(y) → sees (x,y))
∽ $\exists y$ (witch (y) → has(y, black cat) ∧ has (y, pointed hat)

2> $\exists y$ (witch (y) → good (y) V bad (y))

3> $\exists y$ ((sees (x,y) → (witch (y) → good (y)) → get (x, candy)

4> $\exists y$ (witch (y)) → bad (y)) → has (y → black hat))

5> $\exists y$ (sees (x,y) → has (y, pointed hat)

B) FOL into CNF

1) $\exists x \forall y$ (child (x), witch(y) → sees (x,y)).
→ ∽ $\exists y$, (witch (y) → has (y, black hat)
→ ∽ $\exists y$, (witch (y) → has (y, pointed hat)

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

3) $\exists x$ [(sees (x,y) → witch (y) → good(y)) → gets (x, candy

→ $\exists x$ ((sees (x, good (y) → gets (x, candy)]

4> $\exists y$ [bad (y) → has (y, pointed hat)]

→ ~ $\forall y$ [seen (x,y) → has [y, black hat)]

c> sees (x,y)

∽ seen (x, (good ∧ sees (x, bad)

∽ seen (x, good) V seen (x, bad)

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

has (y,z)
{y / good V bad}
{z / black cat V pointed hat}

seen (x, good) v have (good, pointed hat) v gets (x, candy)

seen (x, good) v gets (x andy)

gets (x, candy)

gets (x, candy).

2)

→ 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 ! gets (w, doll)

4) ! child (z) or ! bad (z) or gets (z, col,

5) ! child (ram) → gets (ram, coal)

6) bad (ram)

Resolution.

1) ! child (z) or ! bad (z) or get (z, coal)

6) bad (ram)
7) ! child (ram) or gets (ram, coal)
substituting 2 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) gets (ram, doll) or gets (ram, train) or
gets (ram, coal)
(substituting y by ram)
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 (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)

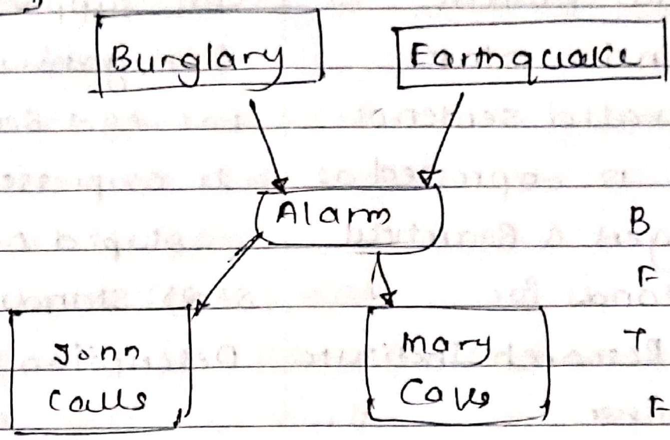
STRIPS language	ADL
1) Only allow positive literals in the states for eg. A valid sentence is STRIPS is expressed as → Intelligent ∧ Beautiful	can support both positive & negative literals For eg → same sentence is expressed as → stupid ∧ ugly
2) STRIPS stands for standard Research Institute problem solver	St 2) Stands for Action 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) Goals are conjuctions for eg. (Intelligent ∧ beautiful)	4) Goals may involve conjuctions & disjunctions for eg. (Intelligent ∧ (Beautiful) ∧ Rich)
5) Effects are conjuctions	6) Conditional effects are allowed : when P:E means E is an effect only if P is satisfied.
7) Does not support equality.	7) Equality predicate (x=4) is build in
8) Does not have support for types	8) 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	0.0.9
F	0.05

A	P(M)
T	0.70
F	0.01

1) The topology of network indicates that

- Burglory and earthquake affect the probability of the alarm going off
- wheather John and marry call depends only on alarm.

→ They do not perceive any burglaries directly They do not notice minor earthquakes 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 uncertainty associated to calling network.

3) The probability actually summarizes potentially infinite sets of circumstances

4) Each row must be sum to 1 because entries represents 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) Every entry in full joint probability distribution can be calculated from information in Bayesian network.

9) A generic entry in joint distributions probability of a conjuction of particular assignments to each variable $P(X_1 = x_1 \wedge \cdots \wedge \ldots$ $X_n = x_n)$ abbreviated as $P(x_1, \ldots, x_n)$

→ $\prod_{i=1}^{n} P(x_i \mid parents(X_i))$, where parents($X_i$) denotes the specific values of the variables parents (X_i)

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

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

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

$= 0.000628$

→ Bayesian Network.