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CSE 512 Artificial Intelligence

Homework #4

Problem 1

Step 1 – Convert to CNF

Propositional sentence

$$\neg L5 \rightarrow \big(\neg(L7 \wedge L2)\big) \equiv L5 \vee \neg L7 \vee \neg L2$$

Set of premises

$$\neg L2 \rightarrow L1 \equiv L2 \vee L1$$

$$L4 \rightarrow L3 \equiv \neg L4 \vee L3$$

$$L5 \rightarrow (L1 \wedge L4) \equiv (\neg L5 \vee L1) \wedge (\neg L5 \vee L4)$$

$$\neg L6 \rightarrow \neg L2 \equiv L6 \vee \neg L2$$

$$L7 \rightarrow \neg L6 \equiv \neg L7 \wedge \neg L6$$

Step 2(a) – Use resolution refutation to disprove contradiction of propositional sentence

Disprove: $\neg L5 \wedge L7 \wedge L2$

1	$L2 \vee L1$	Given
2	$\neg L4 \vee L3$	**Given**
3	$(\neg L5 \vee L1) \wedge (\neg L5 \vee L4)$	**Given**
4	$L6 \vee \neg L2$	**Given**
5	$\neg L7 \wedge \neg L6$	**Given**
6	$\neg L5 \wedge L7 \wedge L2$	**Negated Propositional Sentence**
7	$L6$	**4+6**
8	$\neg L7$	**5+7**
9	$Null$	**5+8, EOP**

Step 2(b) – Use same method to disprove contradiction of propositional sentence

$$\neg L3 \rightarrow (\neg L4 \wedge \neg L5) \equiv \neg L3 \wedge L4 \vee L5$$

Disprove: $\neg L3 \wedge L4 \vee L5$

1	$L2 \vee L1$	Given
2	$\neg L4 \vee L3$	**Given**
3	$(\neg L5 \vee L1) \wedge (\neg L5 \vee L4)$	**Given**
4	$L6 \vee \neg L2$	**Given**
5	$\neg L7 \wedge \neg L6$	**Given**
6	$\neg L3 \wedge L4 \vee L5$	**Negated Propositional Sentence**
7	$\neg L4$	**6+2**
8	$L5$	**6+7**
9	$L4$	**8+3**
10	$Null$	**7+9, EOP**

Problem 2

id	*A*	*B*	*C*	*D*	*Ok*
1	1	0	1	1	0
2	1	1	0	1	1
3	1	1	0	0	0
4	1	1	0	1	1
5	1	0	0	0	0
6	0	1	1	1	1
7	0	1	0	1	1
8	0	1	0	0	0
9	0	1	0	1	1
10	0	0	0	0	0

Step 1 – Find row with best ratio…

$$A = \frac{2}{5} = 40\%$$

$$B = \frac{5}{7} = 71.4\%$$

$$C = \frac{1}{2} = 50\%$$

$$D = \frac{5}{6} = 83.3\%$$

D appears to be the best choice, however, is not 100%, therefore add another row.

Step 2 – Best ratio with row D…

$$D \cap A = \frac{2}{3} = 66.7\%$$

$$D \cap B = \frac{5}{5} = 100\%$$

$$D \cap C = \frac{1}{2} = 50\%$$

Since $D \cap B$ has a 100% ratio, this is a becomes the **first learning rule**. This is also our only learning rule, since we now have 0's in all rows for our 'ok' vector.