CSED342 Assignment 8

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By turning in this assignment, I agree by the POSTECH honor code and declare that all of this is my own work.

Problem 2a

This is our given KB.

$$KB = \{(A \vee B) \to \neg C, \neg(\neg A \wedge C) \to D, A\}$$

First, we will change each knowledge into CNF.

$$\begin{aligned}
(A \vee B) \to \neg C &\iff \neg(A \vee B) \vee \neg C \\
&\iff (\neg A \wedge \neg B) \vee \neg C \\
&\iff (\neg A \vee \neg C) \wedge (\neg B \vee \neg C) \\
\neg(\neg A \vee C) \to D &\iff \neg\neg(\neg A \vee C) \vee D \\
&\iff \neg A \vee C \vee D
\end{aligned}$$

The resulting KB is this.

$$KB = \{(\neg A \vee \neg C) \wedge (\neg B \vee \neg C), \neg A \vee C \vee D, A\}$$

Second, split the knowledge and change it into implied form.

$$\begin{aligned}
KB &= \{(\neg A \vee \neg C) \wedge (\neg B \vee \neg C), \neg A \vee C \vee D, A\} \\
&= \{(\neg A \vee \neg C) \wedge (\neg B \vee \neg C), (\neg A \vee C) \vee D, A\} \\
&= \{\neg A \vee \neg C, \neg B \vee \neg C, \neg(A \wedge \neg C) \vee D, A\} \\
&= \{A \to \neg C, B \to \neg C, (A, \neg C) \to D, A\}
\end{aligned}$$

Third, Use modus ponens.

$$\frac{A \to \neg C, A}{\neg C}, \quad KB = \{\neg C, B \to \neg C, (A, \neg C) \to D, A\}$$

$$\frac{(A, \neg C) \to D, (A, \neg C)}{D}, \quad KB = \{\neg C, B \to \neg C, D, A\}$$

Therefore, we can imply D from the given KB.

Problem 2b

This is our given KB.

$$KB = \{A \vee B, B \to C, (A \vee C) \to D\}$$

First, we will change each knowledge into CNF.

$$\begin{aligned} B \to C &\iff \neg B \vee C \\ (A \vee C) \to D &\iff \neg(A \vee C) \vee D \\ &\iff (\neg A \wedge \neg C) \vee D \\ &\iff (\neg A \vee D) \wedge (\neg C \vee D) \end{aligned}$$

The resulting KB is this.

$$KB = \{A \vee B, \neg B \vee C, (\neg A \vee D) \wedge (\neg C \vee D)\}$$

Second, split the split the knowledge.

$$KB = \{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D\}$$

Third, resolve the knowledge.

$$\frac{A \vee B, \neg B \vee C}{A \vee C}, KB = \{A \vee B, \neg B \vee C, A \vee C, \neg A \vee D, \neg C \vee D\}$$

$$\frac{A \vee C, \neg A \vee D}{C \vee D}, KB = \{A \vee B, \neg B \vee C, A \vee C, C \vee D, \neg A \vee D, \neg C \vee D\}$$

$$\frac{C \vee D, \neg C \vee D}{D}, KB = \{A \vee B, \neg B \vee C, A \vee C, C \vee D, \neg A \vee D, \neg C \vee D, D\}$$

Therefore, we can imply D from the given KB.