491 Knowledge Representation

Tutorial Exercise

Stratified databases

Question 1  Consider the following database DB about policemen:

\[
\begin{align*}
takes \textit{bribes}(x) & \leftarrow \textit{detective}(x), \text{not honest}(x) \\
honest(x) & \leftarrow \textit{policeman}(x), \text{not rich}(x) \\
policeman(x) & \leftarrow \textit{detective}(x) \\
policeman(\text{Eric}) \\
detective(\text{Frank}) \\
\text{rich}(\text{Frank})
\end{align*}
\]

(Note: \(x\) is a variable, \(E\) and \(F\) are constants.)

(a) Construct a supported minimal model for DB using iterated fixpoints (‘ABW’).

(b) Check that your answer is (i) a model (ii) a minimal model and (iii) supported.

Question 2

(a) Consider the following database DB1:

\[
\begin{align*}
\text{strong}(x) & \leftarrow \text{big}(x), \text{not weak}(x) \\
\text{strong}(x) & \leftarrow \text{small}(x), \text{muscular}(x), \text{not weak}(x) \\
\text{weak}(x) & \leftarrow \text{not muscular}(x) \\
\text{small}(\text{Bill}) \\
\text{muscular}(\text{Bill}) \\
\text{big}(\text{Mary})
\end{align*}
\]

(Note: \(x\) is a variable, \(B\) and \(M\) are constants.)

i) Construct the iterated fixpoint model for database DB1.

ii) Check that your answer is a model for DB1 and that it is supported.

(b) Consider the following database DB2:

\[
\begin{align*}
\text{strong}(x) & \leftarrow \text{big}(x), \text{not weak}(x) \\
\text{strong}(x) & \leftarrow \text{small}(x), \text{muscular}(x), \text{not weak}(x) \\
\text{weak}(x) & \leftarrow \text{not muscular}(x) \\
\text{small}(\text{Bill}) \\
\text{muscular}(\text{Bill}) \\
\text{big}(\text{Mary})
\end{align*}
\]

(Note: \(x\) is a variable, \(B\) and \(M\) are constants.)

Is Bill strong or weak according to the ABW semantics?

Question 3  Consider the following normal logic program \(P\):

\[
\begin{align*}
p & \leftarrow r, \text{not } q \\
q & \leftarrow r, \text{not } s \\
r
\end{align*}
\]

Compute the ABW (‘iterated fixpoint’) model of \(P\).

Now suppose you do not stratify but simply compute \(T_P^{\omega}(\emptyset)\). Check you get something different. (If there is a common mistake in exams, this is it. The silly candidate forgets to stratify.)