Principles of AI Planning

Dr. J. Rintanen, M. Ragni

University of Freiburg

Department of Computer Science

Exercise Sheet 7

To be submitted Monday, June 6

Exercise 7.1 (Existential Abstraction – 5 credits)
Construct, by using existential abstraction, the formula that represents the product of the $4 \times 4$ matrices represented by the following formulae.

\[
\begin{align*}
\phi_1 &= a \leftrightarrow a' \\
\phi_2 &= \neg a \leftrightarrow a' \land \neg b \leftrightarrow b'
\end{align*}
\]

Also give the matrices in the conventional tabular form.

Exercise 7.2 (Strong Preimage – 5 credits)
Consider the transition relation \{\{(01, 00), (01, 01), (10, 10)\}\} represented by the formula

\[(a \leftrightarrow \neg b) \land (a \leftrightarrow a') \land (b \leftrightarrow b') \lor (\neg a \land b \land \neg a' \land \neg b')\]

and the set \{01, 10\} of states represented by $a \leftrightarrow \neg b$.

Compute the strong preimage of the set of states with respect to the transition relation by means of universal and existential abstraction as presented in the lecture. Simplify the resulting formula as much as possible.

You may work on these assignments and submit your results in groups of two students. Make sure to clearly indicate both names on your work. **You may write your answers in English or German.** Please return your homework on monday before 14:15.

Exercise marks count towards your final grade for this course, which is calculated from exercise marks (15%) and exam marks (85%).