The Axiomatic Translation of Modal Logic into First Order Logic

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Abstract.

The axiomatic translation is a means by which propositional modal logic may be translated into first-order logic. The axiomatic translation has been implemented as part of the well-know first-order theorem prover SPASS, so that the satisfiability of an arbitrary multi-modal target formulae may be determined. Schema encodings have been implemented for a wide variety of modal axioms (including axioms T, 4, 5, B, D, alt_1, and many other uni-modal and bi-modal axioms). Compositional subformulae may be included in the axiomatic instantiation set if required. The software is able to run in a mode in which only modal axioms and axiom combinations that have been previously proven to be complete are available. An additional experimental mode is available where arbitrary combinations of modal axioms may be used. The classical correspondence properties of modal axioms may be included in the translation, either alone or in a mixed mode together with the axiomatic schema encoding of axioms.

In the documentation provided, the axiomatic translation has been illustrated in detail with many examples, and the use of the software, and it's implementation and testing has been described. The usefulness of the software in solving the satisfiability of many problems in modal logic is illustrated. A large collection of results is presented that form a reference set of data for other investigators. In addition, features of the axiomatic translation have been investigated in a series of experiments. Data is presented on the executions times and completeness of a large number of axioms and axiom combinations, and this has been used to make suggestions for the further development of the axiomatic translation project, both practical and theoretical.

Declaration.

No portion of the work referred to in this dissertation has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Copyright Statement.

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