

Automatic Polytime Reductions of NP Problems into a Fragment of STRIPS

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Abstract

We present a software tool that is able to automatically translate a given NP problem into a STRIPS problem such that the former problem has a solution iff the latter has one, a solution for the latter can be transformed into a solution for the former, and all this can be done efficiently. Moreover, the tool is built such that it only produces problems that belong to a fragment of STRIPS that is solvable in non-deterministic polynomial time, a fact that guarantees that the whole approach is not an overkill (from the perspective of complexity theory). This tool has interesting applications. For example, with the advancement of planning technology, it can be used as an off-the-shelf method to solve general NP problems with the help of planners, to automatically generate benchmark problems of known complexity in a systematic and controlled manner, and to understand the main deficiencies of the heuristics or search algorithms used in planning. More interesting however is the relevance of the approach for the area of Knowledge Engineering in which one of the goals is to devise automatic methods for obtaining planning problems from declarative descriptions of real-world tasks, and for the field of Descriptive Complexity Theory on which the approach rests.

(The full paper on this system appear in the ICAPS-11 Proceedings at pages 178-185)