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Udacity - AIND

Project 2: Research Review

AI planning and search

STRIPS

STRIPS (Stanford Research Institute Problem Solver) is an automated planner, and subsequently also the formal language to its inputs, developed by Richard Fikes and Nils Nilsson in 1971 at the Stanford Research Institute AI Laboratory [1]. While it was originally developed as the planning component of the software for the Shakey robot project at SRI, it made a major impact in the AI planning and search community with its representation language. The STRIPS language representation became a seminal work as most planning systems now use some variant of the STRIPS language [1, 2], commonly known as action languages.

Among these are the Action Description Language (ADL), which relaxed some of the restrictions imposed by the STRIPS language and allowed encoding for more realistic problems [3], and the Problem Domain Description Language (PDDL), which was inspired by STRIPS and ADL and became one of the more widely used modeling languages and as a standard at planning competitions [2, 4].

WARPLAN

Early approaches to planning were based on totally ordered sequences and this 'linear planning' approach was soon found to be inadequate for various problems. This shortcoming necessitated the development of techniques that would 'interleave' actions from different subplans within a single sequence [2]. One of these developments was WARPLAN, which used goal regression planning, where totally ordered sequences could be reordered in such a way to avoid subgoal conflicts [2, 5].

WARPLAN also demonstrated the efficiency of writing a planner in a logic programming language (Prolog), being written in only 100 lines of code [2]. This was a huge advantage, particularly when memory resources were quite limited compared to today.

GRAPHPLAN

The development of the GRAPHPLAN system in 1995 [6] had a dramatic effect on the planning community, producing behavior that was orders of magnitude faster than the partial-order planners of the time. GRAPHPLAN uses a data structure, called a plan graph, which was able to significantly cut down on the search space of the existing planners.

GRAPHPLAN subsequently served as a foundation for other graph-based planning systems, such as IPP, STAN and SGP, and remains a powerful and influential tool in many current systems [2]. One of the major reasons for this is its contribution to heuristic search planners by approximating the search tree rooted at a given state [7].

References

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