

AI Planning Historical Overview

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Artificial Intelligence Nanodegree

AI Planning is a branch of artificial intelligence focused on the realization of strategies or action sequences for problem solving, with the aim of meeting a given goal from an initial state. It arose in the 1960s from investigations into state-space search and theorem proving, and from the practical needs of robotics, scheduling and other domains.

The first major planning system was **STRIPS** (Stanford Research Institute Problem Solver) in 1971 [1]. It was designed as the planning component of the software for the Shakey robot project. This robot was developed to navigate and push objects around in a multi-room environment. In the STRIPS formulation, there exists a set of applicable operators (actions) that transform the initial world model (initial state) into some other world model, with the aim of finding the sequence of actions that lead to a world model where the goal state of the problem exists (goal state). Although the robot, its environment and the tasks performed were quite simple by today's standards, they enabled initial explorations of many core issues in the development of intelligent autonomous systems.

During the following years, research on AI Planning had concentrated on non-linear or partial-order planning algorithms, until the introduction of the **Graphplan algorithm** in 1997 [2], a new approach to planning in STRIPS-like domains. This algorithm, based on an object called Planning Graph, which encodes the constraints from the domain, goals and initial conditions explicitly, is more efficient than space search due to its linear construction. The success of Graphplan impelled research on techniques outside the traditional AI Planning algorithms. [3]

Soon after the introduction of Graphplan, a general purpose satisfiability algorithm was proven to outperform it in many cases. The **Satplan algorithm** (Planning as Satisfiability) [4] converts the planning problem into a boolean satisfiability problem. That means that, given a problem instance in planning (initial state, set of actions, goal and horizon length), a formula is generated so that it is only satisfiable if there exists a plan with the given horizon length. This motivated researchers to investigate translating planning to other computational problems and using specific solvers to find the plans.

More AI Planning techniques have been and are developed nowadays. Although none of them has been outstated as the best technique, competition and cross-fertilization among the approaches have resulted in significant gains in efficiency for planning systems. [5]

References

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