History of AI planning and search

Planning research has been central to AI since the early days. Planning is the process of computing several steps of a problem before starting execution. The problem can be solved by Search algorithms such as A*.

STRIPS was one of the earliest Planning systems, it was part of the Shakey robot project - the first robot which could perceive and reason about its surroundings. It represented a world model as an arbitrary collection of first-order predicate calculus formulas. It was a restricted language consisting of Actions, Preconditions and Effects. It used a version of the QA3 theorem proving system for establishing the truth of the Preconditions for Actions.

Although an efficient reasoning is possible when the STRIPS language is being used, the expressiveness of STRIPS is not suitable for modeling actions in many real world applications. This lead to the development of the ADL language. ADL expressiveness and complexity lies between the STRIPS language and situation calculus. Preconditions and Goals could contain negative literals. States were set of fluents. PDDL (Planning Domain Definition Language) gave a syntax for STRIPS and ADL.

In the 1990s, Avrim Blum and Merrick Furst introduced the GRAPHPLAN system. It could extract a plan directly from the planning graph, rather than just using the graph to provide a heuristic. It explicitly constructs and annotates a Planning Graph, in which a plan is a flow of truth-values in the graph. Helmert (2001) showed that constraint-based approaches, such as GRAPHPLAN are best for NP-hard problems, while search-based approaches do better in domains where backtracking is not necessary.

References:
[1] Artificial Intelligence: A modern approach
[2] STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving
[3] Graphplan home page
[4] Helmert 2001 - On the complexity of planning in transportation domains