Research Review

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Ai planning as a field began to become a distinct area of research in the 1960s and 70s, with several different foundational techniques leading the way.

One of the first of these was STRIPS, developed by Stanford researchers in 1971, which is given descriptions about the world, such as goals, starting state, as well as actions and effects [2]. Strips worked well for finite and fully observable problem sets, where all actions can have observable effects. As a result of the work on Strips, a domain planning language of the same name was developed, which eventually led to the development of PDDL, a frequently used language to represent problems, goals, preconditions, and actions.

An interesting development was non-linear planning, where a goal could be decomposed into subgoals, with paths searched for each sub goal and then combined to reach the main goal. It works well when each goal can be accomplished independently of the others [4]. Compared to linear planning, it had a larger state space to search since the ordering of sub goals meant there were many more possible solutions, and required a more complex algorithm. However non-linear planning was more complete and could find optimal solutions depending on which search strategy was used [3].

The Graphplan System provided much faster results compared to previous planning techniques. It operates by exploring the edge of the state space, with the edges being actions that can be executed [1]. It works to find all branches that reach a shorter solution before expanding the graph to find a solution with 1 additional level. Using mutually exclusive states, it prunes branches that can't possibly lead to a solution. Since it contains all possible actions at each level, its performance decreases as more objects are added. Graphplan also reduces the search space into a polynomial of the problem, rather than an exponential compared with a complete search tree [5].

1: Artificial Intelligence A modern approach, Peter Norvig, Stuart Russell

2: STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving, Richard E. Fikes, Nils J. Nilsson

3: Linear & Non-Linear Planning, https://www.cs.cmu.edu/~reids/planning/handouts/Linear.pdf, R Simmons

4: Non-Linear Planning, ftp://ftp.cs.bham.ac.uk/pub/authors/M.Kerber/Teaching/Planning/l4.pdf, M Kerber

5:Planning and Search, http://www.cs.nott.ac.uk/~psznza/G52PAS/lecture12.pdf