

AI planning developments and impact

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STRIPS, 1971

STRIPS stands for Stanford Research Institute Problem Solver and was developed by Richard Fikes and Nils Nilsson in 1971. STRIPS [1] is the very first official planning approach and has inspired most planning research for the decade to follow. STRIPS was restricted to linear planning and did not allow planning variables, rendering it un-useful for practical problems. However, the language used in STRIPS has left a long-lasting influence on the classical planning languages. STRIPS planner found its application to control the robot Shakey in conjunction with the first online planner called PLANEX (1972). Shakey was the first general-purpose mobile robot that could break down commands into small actions by itself. A notable outcome of this project was the A* search algorithm.

GRAPHPLAN, 1995

GRAPHPLAN is one of the first algorithms during the emergence of Graph planning systems in 90s. The algorithm was developed by Avrim Blum and Merrick Furst. The algorithm used the STRIPS planning language and produced a sequence of operations for reaching the goal. GRAPHPLAN is good for NP-hard problems. Over time GRAPHPLAN [2] has been used as a pre-processor to other search strategies like Sensory GRAPHPLAN (U. Washington) and BLACKBOX (AT&T/Washington). Nguyen and Kambhampati derived accurate heuristics from the planning graph and came up with REPOP (2001), a partial-order planner that scales much better than GRAPHPLAN in parallelized domains [1].

LAMA, 2008

LAMA [3] was the winner of the 2008 International Planning Competition and comes in the category of state-space planning. It is based on heuristic forward search. The iterated weighted A* search greatly improves the planner performance. An upgraded version of LAMA came out in the year 2011. LAMA uses PDDL (Propositional Domain Definition language), which was developed in 1998 and since been used for the international planning competitions. LAMA first runs a greedy best-first search, aimed at finding a solution quickly. Once a plan is found, it searches for progressively better solutions by running a series of weighted A* searches.

It is interesting to note how the development of STRIPS in 1971 provided the framework for further planning research spanning over more than four decades. A* search which was a by-product of the STRIPS project was used more than two decades later in GRAPHPLAN algorithm and almost four decades later in LAMA planner (weighted A*). Similarly, PDDL was developed to overcome the drawbacks of STRIPS, which has become the international standard now.

References:

- [1] Russell S., Norvig P., Artificial Intelligence: A Modern Approach
- [2] Blum A., Furst M., Langford J., Welcome to the Graphplan Page, School of Computer Science, Carnegie Mellon University
- [3] Richter S., Westphal M., Helmert M., LAMA 2008 and 2011