Research Review

STRIPS

STRIPS (Stanford Research Institute Problem) is the first major automated planning system proposed by Richard E. Fikes and Nils J. Nilsson in 1971. The task of STRIPS is to find a sequence of action given the initial state to approach the goal state [1]. STRIPS works when we have complete information about the initial state and the actions are deterministic.

STRIPS represent State as combination of literals and specify Action as a precondition and an effect. The representation language used by STRIPS has been very influential [2].

Partial-Order Planning

Total-order planning like STRIPS will give an exact linear ordering of actions, while Partial-order planning leaves decisions about the ordering of actions as open as possible [3]. Partial-order planning take advantage of problem decomposition by allowing us to solve sub problems independently and then combine the solution.

Partial-order planning dominated planning research in 1980s for its good performance in solving planning problems. However, partial-order planners like NOAH and NONLIN are complex and computational heavy, later it loses its popularity compare to forward-search planners with good heuristics.

Graphplan

In 1995, Avrim Blum and Merrick Furst developed an algorithm for automated planning called Graphplan [4]. Graphplan use a novel planning graph, which reduce number of search needed to find solution and thus performance better than previous planner when it was released. Graphplan is still widely used nowadays and it also inspired other graph planning systems like IPP, STAN.

Graphplan works by first extend and then search the planning graph. Given the proposition at current level, Graphplan uses it with forward search to create action at current level and propositions at next level. Move to next level, Graphplan checks whether all the goal literals are present and there is no mutual exclusion between any pair of them. If so, a solution might exist in current graph, otherwise Graphplan continues to extend the planning graph until goal is satisfied or find out there is no solution. After build the planning graph, Graphplan uses backward

search level by level to search for a valid plan [5]

1. Richard E. Fikes and Nils J. Nilsson. “STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving”. In: Artificial Intelligence 2 (1971), pp. 189–208. http://ai.stanford.edu/~nilsson/OnlinePubs-Nils/PublishedPapers/strips.pdf.
2. Russell, Stuart and Norvig, Peter. Artificial Intelligence: A Modern Approach 3rd Edition, P.410
3. Russell, Stuart and Norvig, Peter. Artificial Intelligence: A Modern Approach 3rd Edition, P. 391.
4. A. Blum and M. Furst. “Fast planning through planning graph analysis”. Artificial intelligence. (1997) 90:281-300.
5. Russell, Stuart and Norvig, Peter. Artificial Intelligence: A Modern Approach 3rd Edition, P. 398.