

AI PLANNING & SEARCH HISTORY

The history of AI planning can be summarized in terms of three important advancements.

STRIPS- The STRIPS formulation [1] attempted to provide a general framework from which more advanced languages were developed. The model attempted to transform the initial world model into a model in which the goal state existed. The problem space for STRIPS is defined by the initial world model, a set of operators and their effects on world models, and the goal statement. An example of STRIPS application is the air cargo transport system using planning search agent.

Planning Graph - This was an optimal planning technique using a novel data structure called Planning Graph [2]. Instead of greedy search, the planning graph object is encoded useful constraints explicitly, thereby reducing the search overhead in the future. Planning Graphs can be constructed in polynomial time and have polynomial size. On the other hand, the state space search is exponential. Planning graphs are not only based on domain information, but also the goals and initial conditions of the problem and an explicit notion of time. The algorithm guarantees that the shortest plan will be found. Edges found in a planning graph represent relations between actions and propositions. Another essential feature of planning graphs is the concept of mutually exclusive (mutex) relationships.

Heuristic Search Planner (HSP): The HSP algorithm is based on the idea of heuristic search. A heuristic search is to come up with an estimate of the distance to the goal. In domain independent planning, heuristics are derived from actions and goals. The HSP algorithm works iteratively by generating states by the actions whose preconditions held in the previous state set.

References

- [1] STRIPS: A New Approach to the Application of 'Theorem Proving to Problem Solving' Richard E. Fikes Nils J. Nilsson
- [2] Fast Planning Through Planning Graph Analysis* Avrim L. Blum School of Computer Science Carnegie Mellon University Pittsburgh PA 15213-3891 avrim@cs.cmu.edu Merrick L. Furst