

AI Planning & Search

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STRIPS (1971)

STRIPS stands for Stanford Research Institute Problem Solver. It's a problem solving program presented in a paper in 1971 by Richard Fikes and Nils Nilsson at Stanford Research Institute. Its based on the concept that state can be described as "world model" and by application of operators, this world model can be transformed into another world model. The task of a problem solver is to find the sequence of operators which lead from the initial world model to the final world model which satisfies the goal condition.

The problem space for STRIPS is defined by the initial world model, the set of available operators and their effects on world models, and the goal statement. The available operators are grouped into families called action schemata. Each operator is defined by describing the preconditions under which the operation becomes applicable and the effect of the application of the operations. When the final state of the world model satisfies the goal statement, we can say that STRIPS has solved the problem.

Planning Graphs (1997)

In a paper presented by Avriem Blum and Merrick Furst at Carnegie Mellon in 1997, they introduced a new approach to planning STRIPS like domains. This approach was based on constructing and analyzing a compact structure called Planning Graph. A new planner called Graphplan was used which always returns the shortest possible partial order plan or states that no plan exists.

The planning graph encodes the problem in such a way that many useful constraints inherent in the problem become explicitly available to reduce the amount of search needed. Planning graphs can also be constructed quickly. They have polynomial size and polynomial time. In a planning graph, a plan is essentially a flow in the network flow sense.

Heuristic Search Planner (HSP) (1998)

HSP is based on the idea of heuristic search. A heuristic search performs forward search from initial state to goal state using an heuristic function that provides an estimate of the distance to the goal. In domain independent planning, heuristics need to be derived from the high level representation of actions and goals. A common way to derive a heuristic function is to solve a relaxed version of the problem which can be solved efficiently.

The main problem is relaxed into a simpler problem. Then the optimal cost for solving the simpler problem can be used as a heuristic for solving the main problem. In STRIPS planning all the delete lists are ignored. The heuristic function thus defined can be used to deal with any STRIPS planning problem as a problem of heuristic search. This opens up to using algorithms like A*

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