RESEARCH REVIEW - HISTORICAL DEVELOPMENTS IN THE FIELD OF AI PLANNING AND SEARCH

The planning problem in Artificial Intelligence is about the decision making performed by intelligent creatures like robots, humans, or computer programs when trying to achieve some goal. It involves choosing a sequence of actions that will (with a high likelihood) transform the state of the world, step by step so that it will satisfy the goal.

Development 1: STRIPS (1971):

In 1971, Richard Fikes and Nils Nilsson at Stanford Research Institute developed a new approach to the application of theorem proving in problem solving. This planning system was used by the robot in Stanford which able to analyses the goals and create plan according to the given set of actions. Goal, create plan and actions are the base for planning languages to describe the problem like Problem Domain Description Language (PDDL). Single sequence must be allowed to get a complete planner interleaving of actions from different subplans.

Development 2: Planning Graphs (1997):

In 1997, Avrium Blum and Merrick Furst at Carnegie Mellon developed planning graph which involved construction and analyzing of STRIPS like domain. Planning Graphs have similar features to dynamic programming problem solvers. The GraphPlan algorithm uses a planning graph to guide its search for a plan. The algorithm guarantees that the shortest plan will be found (like BFS). Edges in a planning graph represent relations between actions and propositions. If a valid plan does exist in the STRIPS formulation, then that plan must exist as a subgraph of the Planning Graph. We can very efficiently solve complex planning problems using the A* star algorithm.

Development 3: Heuristic Search Planner (HSP) (1998)

In 1999 Bonet and Geffner's HSPis based on the idea of heuristic search. A heuristic search provides an estimate of the distance to the goal. In domain independent planning, heuristics need to be derived from the representation of actions and goals. A common way to derive a heuristic function is to solve a relaxed version of the problem. The algorithm transforms the problem into heuristic search automatically by using the problem from the action schema provided.

References:

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