Research Review on AI Planning

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AI Planning studies languages, models and algorithms for describing and solving problems that involves the selection of actions for achieving goals [1]. Planning techniques have been applied in a variety of tasks including robotics, process planning, web-based information gathering, and autonomous agents and spacecraft mission control.

In 1971, at Stanford Research Institute, Richard Fikes and Nils Nilsson developed a new automated planning technique called the Stanford Research Institute Problem Solver (STRIPS). STRIPS is a member of the class of problem solvers that search a space of "world models" to find one in which a given goal is achieved [2]. With STRIPS you first represent the world by a set of well-formed formulas (wffs) of the first-order predicate calculus and once the world is described, you then provide a problem set. A problem consist of an initial state and goal condition. STRIPS can then search all possible states, starting from the initial one, executing various actions until it reaches the goal.

Then in 1997, Avrium Blum and Merrick Furst at Carnegie Mellon developed a new approach to planning in STRIPS-like domains. In this new approach, called Graphplan, rather than immediately start searching as in standard planning methods, the algorithms instead begins by explicitly constructing a compact structure called Planning Graph. [3] A planning graph encodes the planning problem in such a way that many useful constraints inherit in the problem explicitly available to reduce the amount of search needed. Unlike the state-space graph in which a plan is a path through the plan, in a Planning Graph a plan is essentially a flow in the network flow sense. Planning Graphs are based not only on domain information but also the goals and initial conditions of a problem and an explicit notion of time.

HSP is a planner based on the ideas of heuristic search. Heuristic search algorithms perform forward search from an initial state to a goal state using and heuristic function that provides an estimate of the distances to the goal. The main difference with domains specific tasks like the 8-puzzle. Is that in this kind of problem the heuristic is given while in domain independent planning, it has to be derived from the high level representation [4]. A common way to derive heuristics function is to solve a relaxed version of the problem. The main issue is that often the relaxed problem heuristic computation is NP-hard.

The briefly discussed developments in this article constitute 3 major advancements in the field of AI Planning. The STRIPS formulation gave researches a good tool to represent world models and problems, then Planning Graph arose to provide a new perspective on the planning problem. Many research has been done in the field of AI planning, very clever techniques have emerged from previous developments, and without any doubt all this is or will serve as starting point for new great ideas.

Bibliografía

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