Research Review

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Authors of Artificial Intelligence: A Modern Approach indicated on several important breakthroughs which influenced on modern artificial intelligence search and planning. It is worth mentioning **STRIPS**, is an automated planner developed by Richard Fikes and Nils Nilsson in 1971 and used in Shakey, the robot developed at the Stanford Research Institute (SRI). Fikes and Nilsson research assumed that for any world model, there exists a set of applicable operators, each of which transforms the world model to some other world model. This means that, the main task of the problem solver is to find some composition of operators that transforms a given initial world model into one that satisfies some stated goal condition. In STRIPS, a world model is represented by a set of well-formed formulas (wffs) of the first-order predicate calculus. Using first-order predicate calculus wffs, it is possible to represent quite complex world models. 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 role of planning systems is to find sequences of actions which lead from initial state to given goal. As a part of this revolution, STRIPS planner gave Shakey robot the ability to analyze commands and break them down into required actions. http://www.dtic.mil/dtic/tr/fulltext/u2/a227626.pdf , http://ai.stanford.edu/~nilsson/OnlinePubs-Nils/PublishedPapers/strips.pdf http://www.dis.uniroma1.it/~degiacom/didattica/dottorato-stavros-vassos/AI&Games-Lecture6-part1.pdf To summarize, the problem space for STRIPS is defined by three entities: (1) An initial world model, which is a set of wffs describing the present state of the world. (2) A set of operators, including a description of their effects and their precondition wff schemata. (3) A goal condition stated as a wff. The problem is solved when STRIPS produces a world model that satisfies the goal wff.
Further, the authors discussed about planner which have to make possible for interlaving of actions from different subplans within a single sequence. The problem could be solved by applying a goal-regression planning, This technique which assume recording steps in a totally ordered plan, was introduced by Waldinger (1975) and Warren's (1974) **WARPLAN**. Warren work, similar to one later proposed by Waldinger used promotion and chronological backtracking to solve the Sussman anomaly optimally (https://en.wikipedia.org/wiki/Sussman_Anomaly). Notable because it was written in about 100 lines of PROLOG, making it far smaller than other planners of the time.
Finally, the authors indicated also on Champan work, 1987 who designed a constraint-posting planner, called **TWEAK**. TWEAK is a rigorous mathematical reconstruction of previous nonlinear planners. TWEAK is also an implemented, running program. The algorithm captures the essentials of constraint-posting nonlinear planners, but does not always terminate. Chapman in his research has proven that the class of problems TWEAK is designed for is undecidable. TWEAK' S representation includes the following features. The preconditions and postconditions of an operator schema are finite sets of "propositions," A proposition is represented by a tuple of elements, which may be constants or variables, and can be negated. A postcondition of an operator can contain variables not specified by any precondition of the operator, which in effect allows creation of new constants. Chapman proved that planning is undecidable and so clearly demonstrated the difficulty of planning in general.

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