Research review: Planning and search

AI planning arose from investigations into state-space search, theorem proving, and control theory and from the practical needs of robotics, scheduling, and other domains. In this review, we examine tree developments in the planning field from Biographical and Historical notes at the end of the chapter 10 in the AIMA book.

STRIPS

STRIPS (STanford Research Institute Problem Solver) [1], is a problem solver technique created to deal with the big amount of facts and relations found in domains like Robotics. As a problem solving technique, the goal of STRIPS is to find a sequence of actions (operators) to get to the goal from the initial state.

They key features of STRIPS are:

- It uses a representation based on a set of well-know (Horn clauses) formulas of first order predicate calculus (in order to reduce the amount of space needed).
- It separates the process of theorem proving from the process of search through a space of word models .

The theorem proving process is only used within a given model to answers questions about the model, the strategy used is **QA3.5** [2]. For search through a space of world models, STRIPS uses a a **GPS**-like[3] means-end analysis strategy.

QA3.5

QA3.5 [2] is a resolution-oriented theorem-proving program. QA3.5 uses some optimizations in the inference process such as maintain two lists of clauses, one for all the questions in the system and another one with the clauses that are active during the deduction, and predicate indexing by letter and arity (depending on the list of clauses).

GPS

GPS [3] is a problem solving program that was intended to work as a universal problem solver. The key features of GPS are:

- Separation of the problem content with the way in which the problem is solved in order to increase the generality.
- Mean-end analysis, which is a way to control the search process so that we only choose actions that reduce the distance between the current state and the goal state. (Heuristic)
- Planning is a heuristic, which solves some of the problems of Mean-end analysis, that allow to propose a solution in general terms before working out the details.

[1] ‘STRIPS: A New Approach to the Application of .Theorem Proving to Problem Solving’ At http://ai.stanford.edu/~nilsson/OnlinePubs-Nils/PublishedPapers/strips.pdf
[2] “A programming tool for management of a predicate-calculus-oriented database” at https://pdfs.semanticscholar.org/3ab6/793de3b386f4ac841b55bbfcf41ab4dd36a2.pdf
[3] “Report on GPS program” at http://bitsavers.informatik.uni-stuttgart.de/pdf/rand/ipl/P-1584_Report_On_A_General_Problem-Solving_Program_Feb59.pdf