

Research Review - Three Important Developments in the AI Planning and Search Fields

Stanford Research Institute Problem Solver (STRIPS) is a problem solver that uses state-space search to find a state in which the goal is achieved [1]. STRIPS is considered as the first major planning system [2], providing a seminal framework for attacking general planning problems [3]. An initial version of the program was implemented in LISP and was being used in robotics research [1]. The underlying architecture was that of the General Problem Solver (GPS), using means-end analysis strategy [1]. This, combined with formal theorem-proving methods, provided a more powerful approach which solved more complex and general state-space models [1].

PDDL is a computer readable, standardised syntax used to represent planning problems [2]. It was intended to represent the predicates of a domain, what actions are possible, compound actions structure and action effects [4]. It was derived from the original STRIPS planning language [4], which is more restrictive than PDDL - STRIPS preconditions and goals cannot contain negative literals [2]. PDDL is also neutral, it does not integrate conditions or heuristics for choosing actions or compound actions that are in line with the goal [4]. In this sense, it offers the freedom of extending the language in any way that a planning problem requires. There have been several extensions, among which PDDL 3.0 is the most recent version, including plan constraints and preferences [2].

Warplan is a planner that implements goal-regression planning, as a solution to the interleaving problem that online search agents have - interleaving of planning and action resulting in the agent building a map of the environment while it traverses the states [2]. With goal regression, the steps in a totally ordered plan are reordered to avoid conflict between subgoals [2]. Warplan is the first planner written in a logic programming language (Prolog), having only 100 lines of code [2].

References

1. Richard E. Fikes, Nils J. Nilson (1971). "STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving"
2. Stuart J. Russel, Peter Norvig (2010). "Artificial Intelligence: A Modern Approach", Third Edition.
3. Richard E. Fikes, Nils J. Nilson (1993). "STRIPS, a retrospective", Elsevier, Artificial Intelligence 59, 227-232.
4. Malik Ghallab, Craig A. Knoblock, David E. Wilkins, Daniel Weld (1998). "PDDL - The Planning Domain Definition Language".