AIND Planning: Research Review

In this research review I look at major developments in AI planning, particularly looking the progression of planners. Planners have seen great evolution from linear planners such as STRIPS to ADL and PDDL to more complex planners such as WARPLAN.

STRIPS

Stanford Research Institute Problem Solver (STRIPS) was the first major planning system developed in 1971 (Fikes and Nilsson, 1971).[1] STRIPS operates in a deterministic system with absolute understanding of the world and allows for the production of models which can ascertain whether a given goal can be achieved from an input state.

STRIPS had greater impact as a language compared to its planning capability.[2] STRIPS is the foundation for today's planning languages.

ADL and PDDL

Action Description Language (ADL) is considered to be an advancement of STRIPS. It was proposed by Edwin Pednault in 1987.[3] Pednault reasoned that STRIPS could be improved by relaxing some of the STRIPS restrictions, leading to more realistic representations of problems.

Problem Domain Description Language or PDDL developed in 1998 by Drew McDermott and his colleagues was an attempt to standardise AI planning languages.[4] It separated the model of planning problems into two component parts: the domain description and problem description. There have been several revisions to PDDL with the most recent version being PDDL 3.0.[5]

WARPLAN

Planners from the early 1970s generally modelled planning systems linearly but this was discovered to be incomplete.[6] A more complete planner must allow for interleaving of actions from different subplans. Goal regression, a technique which reorders steps in a plan in order to avoid conflicts, provides a solution to the interleaving problem. This was introduced by David Warren with the WARPLAN planner.[7]

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[1] Fikes, Richard E., Nils J. Nilsson (1971), "STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving"

[2] Russell, J. Stuart, Peter Norvig (2010), "Artificial Intelligence a Modern Approach (3rd Edition)", p. 394

[3] Pednault, Edwin (1987) "Formulating multi-agent dynamic-world problems in the classical planning framework". In Michael Georgeff and Amy Lansky, editors, "Reasoning about actions and plans" pages 47-82.

[4] McDermott, Drew, Ghallab, Malik, Howe, Adele; Knoblock, Craig; Ram, Ashwin, Veloso, Manuela, Weld, Daniel; Wilkins, David (1998), "PDDL - The Planning Domain Definition Language"

[5] Gerevini, A.; Long, D. (2006), "Preferences and Soft Constraints in PDDL3"

[6] Sacerdoti, Earl D, (1975), "The Nonlinear Nature of Plans"

[7] Russell, J. Stuart, Peter Norvig (2010), "Artificial Intelligence a Modern Approach (3rd Edition)", p. 394