Research Review: Historical developments in AI planning and searching methods and their impacts on AI as a whole.

James Mallett: AIND-Planning Project

In 1971, the first major planning system was developed by Fikes and Nilsson, named STRIPS (Fikes and Nilsson, 1971). This system was developed as the planning component of the software used to control the Shakey robot project at SRI. STRIPS influenced much of the language that is used today as "classical" planning language, and the language used by it has been much more influential than its algorithmic approach. This system was modelled on a GPS and the solver used a state-space searching system that used a means-to-an-end analysis in order to solve its problems, this was done by defining action schemes in terms of preconditions, actions and effects. This planning system was shown to be PSPACE-complete and, although it had many restrictions, in 1986 Pednault developed ADL (Action Description Language) which allowed some of the restrictions to be relaxed, and for more realistic problems to be encoded using this system.

ADL and STRIPS both contributed to the developed of Problem Domain Description Language, or PDDL (Ghallab et al., 1998). This has been used as the standard international language for planning problems since it was developed in 1998. PDDL was initially brought forward as a standardized syntax for representing planning problems that was computer-parsable, and there has been several extensions on it, the most recent of which was PDDL 3.0 which included constraints and preferences (Gerevini and Long, 2005). By using PDDL as a standard language for these types of problems, it allows for research and breakthroughs to be reused easily without the need for any conversion, it also allows for seamless collaboration between researchers and other people that are involved in the field of AI and planning.

Planning systems in the early 1970's an approach called linear planning, which was discovered by Sacerdoti in 1975 to be incomplete. This type of planning decomposing problems, that were considered totally ordered actions sequences, and computing a subplan for each subgoal of the problem, and then stringing these subplans together in some particular order. This planning system was shown, by Allen Brown while experimenting with the HACKER system (1975), to be unable to solve some very simple planning problems, the cause of which was found to be the absence of the ability to interleave actions from different subplans within a single sequence.

A solution to the interleaving problem was implemented by Waldinger (1975) and also in Warren's (1974) WARPLAN. The problem was alleviated by using goal regression planning, this is a technique that reorders steps in a totally ordered plan to avoid any conflict between the sub goals of the solution. WARPLAN was the first planner that was written in a logic programming language (Prolog), and is one of the best examples of the economy of using logic programming. This is because WARPLAN was written in only 100 lines of code, a fraction of what was being used for planners at the same time