Research Review

Article:

Artificial Intelligence: A Modern Approach – Bibliographical and Historical notes at the end of Chapter 10

In 1971, Fikes and Nilsson publish the STRIPS, the first major planning language. Originally STRIPS was designed as part of the software for the Shakey robot project at SRI. Overall its control structure is model on a state-space search system using means-end analysis. Later on, more contributions made to STRIPS including Lifschitz provided precise definitions and analysis of STRIPS in 1986, and Bylander showed simple STRIPS planning is Pspace-complete in 1993. The representation of action in STRIPS became very influential, even much more influential than its algorithmic approach. Almost all planning system since then borrow features from STRIPS language.

Later on, the limitation and tradeoffs among formalisms in STRIPS is getting more and more clear. In 1986, Pednault published the Action Description Language (ADL), to relax some restrictions in STRIPS and made it possible to encode more real world problem. 12 years later in 1998, the Problem Domain Description Language (PDDL) was introduced by Ghallab as computer-parsable, standardized syntax for representing languages like STRIPS and ADL. Beginning in 1998, PDDL become the standard language for planning competition at AIPS conference.

In the early 1970s planners usually work with ordered action sequence. To achieve problem decomposition, a sub-plan for each sub-goal need to be computed and then strings the sub-plans together in order. This is called linear planning developed by Sacerdoti in 1975, and soon this is found incomplete. Some very simple problem cannot be solved by linear planning, such as Sussman anomaly. It turns out a complete planner must allow for interleaving of actions from different sub-plans within a single sqquence. In 1975 Waldinger introduced a solution to the interleaving problem called goal regression planning. It is a technique in which steps in a totally ordered plan are reordered so as to avoid conflict between subgoals. This is used by Warren's WARPLAN. WARPLAN was the first planner to be written in Prolog and is a great examples of the remarkable economy by using logic programming: WARPLAN is only 100 lines of code.