Implement a Planning Search - Research Review

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From STRIP to PDDL

STRIPS [1] is an automated planning agent and is the first major planning system. It was designed as the planning component of a robot software in Stanford Research Institute. Its importance is far more in its representation language than in its algorithmic approach. The STRIP language pose the planning problem as a search problem by defining several entities:

- Initial State
- Goal states
- A set of actions – where each action has preconditions and post conditions (effects)

The ADL (Action Description Language)[2] has evolved from the STRIP's language, relaxing some of its restrictions and making it possible to encode more realistic problems (e.g. open world principle, negative literals and disjunctions are allowed).

The PDDL (Problem Domain Description Language)[3] was introduced as a computer-parsable, standadized syntax for representing planning problems , inspired by STRIP and ADL , and has been used as the standard language for the IPC competition. The most recent version is PDDL 3.0 [4] is the de-facto standard language to provide factored representation of planning problems.

PDDL describes the initial and goal states as conjunctions of literals and actions in terms of their preconditions and effects.

Some important planning approaches

Planners in the early 1970s considered totally ordered action sequences. This approach is called linear planning was soon discovered to be incomplete (cant solve Sussman anomaly). One solution to this problem was WARPLAN[5] planner in which the steps are reordered so as to avoid conflict between subgoals. WARPLAN was written in logic programming language and was very economical with the number of code lines.

Partial order planning approach were introduced at the same time (1975) and dominated the next 20 years of research. The underlying ideas include the detection of conflicts and the protection of achieved conditions from interference.[6,7]

The partial order planning approaches fell out of favor in the late 1990's as faster methods emerged. In 2001, Nguyen and Kambahmpati [8] proposed the RePOP planner that adapted efficient techniques like distance based heuristics, reachability analysis and disjunctive constraints handling to dramatically improve the Partial Order Planning algorithms. Their RePOP scales up much better than GRAPHPLAN in parallelizable domains and is competitive with the fastest state-space planners.

References

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