Research Review

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STRIPS

STRIPS is the first major planning system proposed by Fikes and Nilsson. The representation language used by STRIPS has been far more influential than its algorithmic approach; what we call the "classical" language is close to what STRIPS used [1]. A STRIPS instance is consisted of:

1. An initial state
2. Specification of goal states
3. A set of actions
    a. each action includes preconditions
    b. each action includes postconditions

A plan for such a planning instance is a sequence of operators that can be executed from the initial state and that leads to a goal state [2].

ADL

The Action Description Language (ADL) relaxed some of the STRIPS restrictions and made it possible to encode more realistic problems [1]. An ADL schema consists of an action name, an optional parameter list and four optional groups of clauses labeled Precond, Add, Delete and Update. The formal semantic of ADL is defined by 4 constraints: (1) actions may not change the set of objects that exist in the world (2) actions in ADL must be deterministic (3) functions must be representable as first-order formulas (4) set of states in which an action is executable must also be representable as a formula. The difference between ADL and STRIPS includes: (1) The STRIPS language only allows positive literals in the states, while ADL can support both positive and negative literals. (2) In STRIPS the unmentioned literals are false. In ADL the unmentioned literals are unknown. (3) In STRIPS we only can find ground literals in goals. In ADL we can find quantified variables in goals. (4) In STRIPS the goals are conjunctions. In ADL goals may involve conjunctions and disjunctions. (5) In STRIPS the effects are conjunctions, but in ADL conditional effects are allowed. (6) The STRIPS language does not support equality while ADL does. (7) STRIPS does not have support for types while ADL does.

Satplan

Satplan (Planning as Satisfiability) is a method for automated planning. It converts the planning problem instance into an instance of the Boolean satisfiability problem, which is then solved using a method for establishing satisfiability such as the DPLL algorithm or WalkSAT. Given a problem instance in planning, with a given initial state, a given set of actions, a goal, and a horizon length, a formula is generated so that the formula is satisfiable if and only if there is a plan with the given horizon length [4]. It can only find plans of fixed maximal length, and a PDDL problem description has to be translated to a suitable form to apply Satplan. Helmert showed that constraint-based approaches such as GRAPHPLAN and SATPLAN are best for NPhard domains, while search-based approaches do better in domains where feasible solutions can be found without backtracking. However, both GRAPHPLAN and SATPLAN have trouble in domains with many objects because that means they must create many actions [1].

Reference

[1] Russel, Stuart and Norvig, Peter. Artificial Intelligence: A Modern Approach 3rd Edition, P.393-396

[2] https://en.wikipedia.org/wiki/STRIPS

[3] https://en.wikipedia.org/wiki/Action_description_language

[4] https://en.wikipedia.org/wiki/Satplan