AI planning and search Historical development research review

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AIND – IMPLEMENT A PLANNING SEARCH

In this short review, historical development and the impact of the major developments in AI planning and search field is discussed.

STRIPS: STanford Research Institute Problem Solver

STRIPS was one of the first project in the field of AI planning and search, developed by Richard Fikes and Nils Nilsson in 1971 at SRI (Stanford Research Institute) International[i].STRIPS was primarily used for robot research at SRI. A STRIPS instance is consisted of an initial state, goal states and set of actions in which each action contains pre-conditions and post-conditions. The planner goal is to alter the initial state by applying a series of action that will lead to the goal states.

The representational language used by STRIPS has been far more influential than its algorithmic approach, as it is very close to the classic planning language[ii]

PDDL: Planning Domain Definition Language

PDDL was introduces as a computer-parsable, standardized syntax fir representing planning problems and has been used as the standard language for the International Planning Competition since 1998[ii]. PDDL was derived from the original planning language (Fikes and Nilsson, 1971), which is slightly more restricted than PDDL as the original STRIPS preconditions and goals cannot contain negative literals[i].

PDDL allows common formalism of for planning domains which results in far greater reuse of research and allows direct comparisons of systems and therefore support faster progress in the field[iii]

GRAPHPLAN: Faster planning through planning graph analysis

GRAPHPLAN [iv] was one of the major advantages in the field of AI planning and search. It takes an input a planning problem expressed in STRIPS type representation language and produces, if possible, a sequence of actions for reaching the goal state. GRAPHPLAN reduces the amount of search needed as instead of traditional search space it uses graph in which each node represent a possible state and edges represent reachability through a certain action.

While GRAPHPLAN improves the search speed in magnitude when compared to traditional search space in problems where there are not many objects but traditional search space still holds the edge in those cases where there are more objects.

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

[ii] *Artificial Intelligence: A Modern Approach* by Norvig and Russell

[iii] *Fox, M.; Long, D. (2002). "PDDL+: Modeling continuous time dependent effects". Proceedings of the 3rd International NASA Workshop on Planning and Scheduling for Space*.

[iv] *A. Blum and M. Furst (1997). Fast planning through planning graph analysis*