Planning Historical Developments Research Review

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This short review describe the major planning and search developments. And, briefly explain their relation and influence in the field of artificial intelligence.

Planning

Planning is one of the major field of AI, which is an explicit deliberation process that chooses and organizes actions by anticipating their outcomes. And the AI planning is the computational study of this deliberation process by executing the sequential action through intelligent agents such as autonomous vacuum cleaner, self driving cars, etc. To accomplish the assign task (such as vacuum cleaner keep our house clean), the system need to have input data containing descriptions of initial states of the world, desired goals and actions. Now, the role of planning system is to achieve those goal states from the initial states by implementing the sequence of actions.

Stanford Research Institute Problem Solver(STRIPS)

STRIPS is an automate planner technique that works by executing a domain and problem to find a goal. STRIPS was primarily used for robots research(Shakey) at Stanford Research Institute. This automate planner was designed by Richard Fikes and Nils Nilsson in order to find a series of operators in a space of world models to alter an initial state into a model in which a given goal formula can be proven to be true[1]. As an elaboration, with STRIPS, first the world has given the actions, objects, preconditions and effects. Once the world describe then give the problem. After that STRIPS search all possible states, starting from the initial one, executing various actions, until it reaches the goal. The STRIPS plays an important role in the field of artificial intelligence by providing the representation language which is close to the "classical" planning language.

Planning Domain Definition Language(PDDL)

PDDL is the first modeling language which attempts to standardize Artificial Intelligence (AI) planning languages. It was first developed by Drew McDermott and his colleagues in 1998 to be used as a standard language for problem solving for the International Planning Competition on 1998[2].
The PDDL was primarily inspired by STRIPS and ADL(Action Development Language). The adoption of a common language for representing and solving planning problems foster

for greater reuse of research, allows direct comparison of system and approaches in an easier way, and therefore support faster progress in artificial intelligence field[3].

WARPLAN

Early research in the planning domain normally used linear programming[2], which discovered incomplete and hence new notion of interleaving; being able to interleave actions from different sub-plans within a single sequence was introduced.
Solution to interleaving problem was goal-regression planning; all the steps are ordered to avoid conflict between subgoals. This is introduced by Waldinger(1975) and is called WARPLAN. This is the first planner to be written in a logic programming language and is only 100 lines of code and gives great benefits in terms of reducing complexity.

References

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

[2] Stuart J. Russell, Peter Norvig (2010), Artificial Intelligence: A Modern Approach (3rd Edition).

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