

Research Review

Artificial Intelligence Nanodegree

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Planning is a branch of artificial intelligence that deals with building strategies or sequences of actions to solve a problem. In the past 40 years, this area has seen a wide variety of improvements that have led to it being a powerful tool for researchers. In this paper, I will discuss three of these improvements: the Stanford Research Institute Problem Solver (STRIPS), Action Description Language (ADL), and Planning Domain Definition Language (PDDL).

STRIPS was developed by Richard Fikes and Nils Nillson in 1971 for the purpose of automated planning. It was originally designed as an actual planner, but the language that Fikes and Nillson developed was its most significant contribution to AI. The STRIPS language became the basis for most automated planning languages currently in use including ADL and PDDL. A STRIPS instance consists of: an initial state, specified goal states, and a set of actions. For each action in the action set, preconditions must be established prior to the action and postconditions must be established after the action. A critical restriction of STRIPS, which limits its utility, is the assumption of perfect knowledge of the initial state. This is not always the case for planning problems and in those cases this assumption could prevent valid actions from being explored.

ADL was developed by Penault in 1986 with the intention of being used for planning the actions of robots. ADL improved upon STRIPS by allowing operator effects to be conditional. Key to advancing AI planning over STRIPS is that ADL is open world so unknown conditions are not assumed to be automatically false. It also added the use of negative literals and disjunctions to the toolkit provided by STRIPS. These improvements make ADL more flexible for planning applications by allowing more flexibility in how the system executes actions in order to reach its goal.

PDDL was developed by McDermott and his fellow colleagues in 1998 when they recognized the need for a more standardized AI planning language for use in the International Planning Competition (IPC). The main contribution of PDDL is that it has enabled researchers and competitors to share, re-use, and compare their work. This represents a significant advance in AI planning and has made many other advances in AI possible. This is the language used in a large portion of this project, in combination with situational calculus. It allows us to define a goal, actions, conditions, and mutex, to enumerate over fluents to develop plans for reaching the goal.

References

1. <https://en.wikipedia.org/wiki/STRIPS>
2. https://en.wikipedia.org/wiki/Action_description_language
3. https://en.wikipedia.org/wiki/Planning_Domain_Definition_Language