

Important historical developments in the field of AI planning and search

AI Planning is concerned with finding a sequence of actions to move from the current state to a desired state (goal state). Search is a technique to achieve the same.

In the history of the evolution of planning and search, I find the following three events interesting.

1. Graph Plan – An Algorithm

Graph Plan is an algorithm to solve the planning problem. It accepts as input a problem expressed in STRIPS (which had influenced PDDL) and produces a sequence of operations to reach from start state to goal state.

It was developed in 1995 by Avrim Blum and Merrick Furst.

It makes use of Planning Graph, which is a datastructure that makes it easy to use better heuristic estimates. It was order of magnitude faster than the contemporary algorithms. It helped revitalize the field of planning and advance the research in this domain.

2. The Problem Domain Description Language – A Language

PDDL was developed as a language to frame planning problems. It was developed by Drew McDermott and colleagues in 1998. It was inspired by other languages of the time, like STRIPS and ADL. The main intention was to create a common language which participants could use to participate in the International Planning Competition in 2000. But the bigger impact was that it brought about a common formalism for describing planning problems in the community – across researchers and practitioners. It's design was a compromise between being very expressive (complex enough for developing potential applications) and very well grounded for research (simple enough for doing research based on foundational ideas).

PDDL has undergone many iterations of improvement since 1998, the latest version being 3.1. It has also triggered many extensions or variations, like PDDL+, NDDL and MAPL.

3. Representing plans as Binary Decision Diagrams – A Data Structure

BDD is a data structure to express boolean logic. It uses a compressed representation sets or relations. The main advantage of BDD is that when operations are performed on this data structure, they are directly carried out in the compressed version of the expressions, i.e. without needing to decompress them.

Cimatti et.al. designed a planner based on this data structure in 1998. The benefit of using this structure was that there were already available techniques to prove various properties of a binary decision diagram, including it being solution to a planning problem.

Ref:

- https://en.wikipedia.org/wiki/Planning_Domain_Definition_Language
- <https://en.wikipedia.org/wiki/Graphplan>
- https://en.wikipedia.org/wiki/Binary_decision_diagram
- AIMA 3ed.