Historical developments in the field of AI planning and search

Planning Domain Description Language

From the representation languages that was used by STRIPS, the first major planning system developed by Fikes and Nilsson, to Action Description Language, and most recently the Planning Domain Description Language (PDDL), planning languages have go a long way to become a powerful tool to describe and solve a planning problem.

PDDL was first introduced by Ghallab et al. in 1998. It was developed with computer-parsable and standardized syntax for the intention of using in the International Planning Competition (IPC) in 1998. Since then, it has been gradually developed and extended. Nowadays, almost all the planners support a subset of PDDL. The latest version of PDDL is PDDL3.1 and it was used for IPC 2011 and IPC 2014.

PDDL inspired deeper researches into the planning or Artificial Intelligence field. For example, PDDL+ to model continuous time-dependent effects [1] or the use of PDDL2.1, an extension to PDDL, for describing the temporal planning domains [2].

State-space planning

The UNPOP program (1996) by Drew McDermott was one of the first to take interest in state-space planning, which is also the first to suggest the ignore-delete-list heuristic.

Heuristic Search Planner (HSP) was created by Blai Bonnet and Hector Geffnor. HSP is a planner based on the idea of heuristic search and it is one of the first to make state-space search practical for large planning problems [3].

The most successful state-space planner is FastFoward (FF) from Jorg Hoffmann at Albert-Ludwigs University, Freiburg. The planner was awarded for Outstanding Performance at the 2nd IPC and Top Performer in the Strips Track of the 3rd International Planning Competition [4].

Binary decision diagram

Binary decision diagram (BDD) is the compact data structure for representing Boolean functions, which use Booleans as input and return Booleans as output.
BDD possesses the property of being the solution to a planning problem. In 1998, Cimatti et al. presented a planner based on this approach.
BDD is described by Donald Knuth in a 2008 lecture as "one of the only really fundamental data structures that came out in the last twenty-five years." [5]

Reference

[1] Maria Fox, Derek Long (2002), ***PDDL2.1 : An Extension to PDDL for Expressing Temporal Planning Domains***, Proceedings of the 3rd International NASA Workshop on Planning and Scheduling for Space.

[2] Maria Fox, Derek Long (2003), ***PDDL2.1 : An Extension to PDDL for Expressing Temporal Planning Domains***, Journal of Artificial Intelligence Research.

[3] Peter Norvig and Stuart J. Russell, ***Artificial Intelligence: A Modern Approach***, 3rd edition.

[4] Donghong Liu, ***Heuristic Search Planners***, Last access: Dec 1, 2017, link.

[5] Randal E. Bryant, ***Curriculum Vitae***, Last access: Dec 1, 2017, link.