

# Historical Developments in AI Planning and Search

## Research Review

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Planning is one of the essential components of intelligent systems. The techniques used in planning have been applied in a variety of tasks including robotics and other autonomous agents. Planning generally involves the representation of models, the effect of actions and techniques for efficiently searching the space of possible plans

Developed by Richard Fikes and Nils Nilsson in 1971, STRIPS (Stanford Research Institute Problem Solver) is considered the first major planning system. Even though an efficient reasoning is generally possible in the case of STRIPS but in many cases, its expressiveness does not suit the making of models in real world. This motivated the development of the Action Description Language or ADL (Pednault, 1986). The ADL made it possible for efficient algorithms to be developed by reducing some of the restrictions that were present in STRIPS. The Problem Domain Description Language or PDDL (Ghallab, 1998) was later introduced and has been used as the standard language for the International Planning Competition since then.

In 1973, the thesis by Gerald Jay Sussman [1], introduced a model called "HACKER". HACKER is a problem solving agent whose performance improves with experience. When attacking a problem, HACKER first checks to see if it can find a solution in its Answer library by checking if the pattern of applicability in any of its programs matches to that of the problem statement. If it finds such a program, it runs it. However, if no program is found in the Answer library, it comes up with a new solution using some general knowledge of programming techniques. In the construction of the new solution, HACKER is now careful to avoid certain bugs that might have previously appeared. This new solution is then also stored in the Answer library so that if a similar problem shows up again, it can be solved quickly in the future

Recently there has also been interest in the use of Binary Decision Diagrams. Binary Decision Diagrams as introduced by Bryant (1986) are data structures that represent Boolean functions. A BDD is a directed acyclic graph with one root and two terminal nodes. Each internal node corresponds to a binary variable and has two child nodes. An important application of BDDs has been in computer aided verification [Burch et al., 1994; Clarke et al., 1994], however, now these same techniques have also found a way into AI planning.

Over the past few years, many techniques have emerged for development in the field of planning. Research on this topic has been central in the field of AI with various journals and conferences dedicated to this topic

## References

[1]<http://www.cs.cmu.edu/~mmv/planning/readings/AITR-297.pdf>

[2]<http://gki.informatik.uni-freiburg.de/teaching/ss04/aip/script.pdf>