Research Review

Historical Development of Planning Techniques

This is a review of three major developments in the field of AI planning. According to Dr. Gerhard Wickler and Prof. Austin Tate from the University of Edinburgh [1], planning serves to further two goals of AI, a scientific goal, and an engineering goal:

1. The scientific goal: to understand intelligence. Planning is an important component of what we consider to be rational (intelligent) behavior.
2. The engineering goal: to build intelligent entities. Planning software allows us to choose and organize actions for autonomous intelligent machines.

Here are the three developments I've chosen for this review:

1. The PDDL language
2. Heuristic Search Algorithms
3. Planning Graphs

These three developments are extremely influential in planning today. They are used in a lot of applications and inspired a lot of new research in the field.

PDDL (Problem Domain Description Language) is a planning language based on a classical representation but incorporating a large number of extensions [2]. It was introduced as a new computer-parsable language with a standardized language. It has been used as the standard language in the International Planning Competition as well as in many other applications.

Heuristic search algorithms were first developed in the mid-1960s. The a* search followed a few years later. These gave rise to a huge wave of subsequent research in the field of heuristic search algorithms. They are used in various problems from games to natural language processing.

Planning graphs are another important development which was first used in the GraphPlan algorithm. Planning graphs are a type of data structure used to determine whether a planning problem has a solution and to offer information about the interactions between actions and literals. They can also offer an estimate of how difficult it is to achieve goals starting from the initial state.

These developments are significant as they each solved certain layers of planning problems. The PDDL language is used as a standard on top of which to develop different approaches, heuristic search algorithms found new ways of solving certain types of problems and planning graphs can be used to solve classical planning problems faster than by using other types of search. These areas of AI planning also gave rise to a lot of research currently being done in the field.

Despite being purely planning problems, the above techniques are also used in the design and study of intelligence and intelligent agents, thus furthering the progress of the field of artificial intelligence.

Concluding, we can see that these three developments have been significant in the sphere of planning and AI and that they are often used together to design problem solvers.

[1] AIPLAN - What Is Planning? https://www.youtube.com/watch?v=yCZQ18SPP44

[2] Automated Planning (Ghallab et al., 2004)

[3] Artificial Intelligence - A Modern Approach (Stuart Russell and Peter Norvig)