Historical developments in AI Planning

This research review is an attempt to analyze the historical developments in the field of Artificial Intelligence Planning. There are three developments being considered – STRIPS, Planning Graphs and Heuristics Search Planner. We will explore the three developments and their relationships in this review and analyze their impact on the field of Artificial Intelligence.

STRIPS

STRIPS were formulated in 1971 by Richard Fikes and Nils Nilsson at the Stanford Research Institute. A set of applicable operators are assumed to exist which transform a state or model into some other state or model. The problem solver has to find a sequence of operators which transform the given initial state into the one that has the goal conditions satisfied. Each operator corresponds to an action routine whose execution causes the agent to take certain actions.

Planning Graphs

They were developed in 1997 by Avrium Blum and Merrick Furst at Carnegie Mellon. They reduce the search overhead by explicitly incorporating the constraints. Mutually exclusive relationships can be specified in planning graphs. Similar to the Breadth First Search (BFS) this guarantees that the shortest plan will be found first. Any plan found by this algorithm is a legal plan and the algorithm also offers termination guarantee.

Heuristic Search Planner

This algorithm was developed on the idea of heuristic search. A heuristic provides an estimate of the distance to the goal. The common method used to derive a heuristic function is to solve a problem by dropping its preconditions. This leads to a challenge that such functions compute a NP-Hard problem. The Heuristic Search Planner algorithm computes the optimal value of the problem that has relaxed preconditions.

Conclusion

STRIPS started off the planning approach by giving you a framework. Planning Graphs helped to provide optimal planning techniques. Heuristic Search Planner helps to automate and apply heuristics to general planning problems. These three techniques have helped to progress and refine the planning approach in the field of Artificial Intelligence.

References

1. Artificial Intelligence: A Modern Approach by Norvig and Russell – Third Edition – Chapter 10 –Bibliographical and Historical Notes – Pg 393 – Pg 395

2. AI Planning Historical Developments by Ryan Short – Published in Medium on Sep 4, 2017 - https://towardsdatascience.com/ai-planning-historical-developments-edcd9f24c991 - accessed on Jan 1, 2018