3 Important Historic Developments in AI Planning

General problem Solver (GPS) using Means-Ends Analysis (MEA): 1959

The basic idea of MEA is to only search relevant aspects of a problem. In this approach once the problem/world states are defined as different states and operators, the goal state which is an end is reached by finding the operators which will reduce the difference between the initial state to goal state.

The goal state is added to a stack and then if the initial state is same as goal state then return it and exit. If that is not the case then calculate the difference between the initial and goal state and choose an operator or action to reduce the difference.

GPS with MEA became basis to STRIPS which changed the AI world forever so that is its biggest contribution to the world.

Newell, Allen, John C. Shaw, and Herbert A. Simon. "Report on a general problem solving program." IFIP congress. Vol. 256. 1959.

STRIPS – Stanford Research Institute Problem Solver: 1971

STRIPS employs resolution theorem prover to answer questions of particular models and uses means-ends analysis to guide it to the desired goal-satisfying model. It is designed to solve problems faced by a robot in re-arranging objects and in navigating. STRIPs uses General Problem Solver (GPS) like means-end analysis strategy for searching which allows STRIPS to combine many of the advantages of both forward search and backward search.

STRIPS was part of Shakey, the world changing robot which inspired and became predecessor to many AI marvels and algorithms. STRIPS helped Shakey with his abilities of visual analysis, route finding, object manipulation and more. For this reason, STRIPS is also called as an ancestor of self driving cars, military drones, Mars rovers and overall field of Robitics and AI. Biggest contribution of STRIPS is to give the world a taste of a language which later became PDDL (Planning Domain Definition Language) which is now fundamental to most AI Planning research.

Fikes, Richard E., and Nils J. Nilsson. "STRIPS: A new approach to the application of theorem proving to problem solving." Artificial intelligence 2.3-4 (1971): 189-208.

Dynamic Macro-Based Heuristic Planning through Action Relationship Analysis: Feb 2015

This relatively new research paper is about automatically improving the design of a heuristic search function by analyzing the action relationship of a solved problem in the same domain. Rather than focusing on domain-independent planning, this approach sets out to use the domain knowledge to improve the planner performance.

The researchers studied and extended an approach that investigates relationships among actions. They then propose an algorithm that generates macros from solved cases and establish a dynamic heuristic that reuses the generated macros, and integrate the heuristic into a working planning system called the Dynamic Macro-based FF or DM-FF system.

Jiang, Zhuo, et al. "Dynamic Macro-Based Heuristic Planning through Action Relationship Analysis." IEICE TRANSACTIONS on Information and Systems 98.2 (2015): 363-371.