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Historical Developments in AI Planning and Search

The roots of Artificial Intelligence and the some of the concepts can be traced back to Greek mythology. In 4th century B.C, Aristotle invented syllogistic logic, which was the first formal deductive reasoning system that was documented **[1]**. But it wasn't until the 20th century when the modern techniques in Artificial Intelligence started to emerge. John McCarthy coined the term "AI" as a topic for the Dartmouth Conference in 1956 **[1]**. In 1995, Blum and Furst introduced the Graphplan algorithm which diverged the field of AI Planning from so-called non-linear planning. The Graphplan algorithm had two characteristics: it found plans of a fixed length and it sued reachability information to prune the search tree **[2]**. IBM's Deep Blue chess program beat Garry Kasparov in 1997, which sparked a huge interest in the technology industry and tremendous growth in research and development was made in this field **[1]**.

Planning can be viewed as a constraint satisfaction problem where an incremental search is made for a plan. The two main benefits of the plan search is: i) shortest plans are found (relative to time) and ii) the initial and goal states can be effectively used, reducing te exhaustive search **[2].** Usually, planning problems get more and more difficult as more flexible inputs are allowed which lead to fewer constraint requirements. This results in an exponential growth in the space of possibilities needed to explore by the planning algorithm. This is when the efficiency of search comes into the picture **[3]**.

Some of the search techniques include 'typed preconditions`: in which the user's intention of the way in which a precondition should be satisfied is encoded. Another one is 'branch1/branchN': which provided a measure of the impact on the search space as next level and primitive level. Third one is 'issue dependencies': in which an an explicit language releases an issue for processing at the most opportune time **[2]**. These methods increase in efficiency as the complexity of planning problems increase. "Planning is reasoning on actions, of different kinds and at different levels." **[2]**. Adding the heuristic component to planning and search resulted in a significant improvement in the runtime behaviors of the algorithms. In the AIPS-2000 planning systems competition, four out of five awarded automatic planners implemented planning with heuristics. This success stems from the quality of their heuristics that were used **[2]**.

Sources:

[1] A brief history of AI: https://aitopics.org/misc/brief-history

[2] An overview of recent algorithms for AI Planning (Jussi and Jorg, Germany):

http://www.cs.toronto.edu/~sheila/2542/w06/readings/RintanenHoffmann01.pdf

[3] Controls in AI Planning: https://www.dagstuhl.de/Reports/96/9647.pdf