Summary of Research in AI Planning and Search

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Stanford Research Institute Problem Solver (STRIPS)

STRIPS is a language for the representation of planning problems that should make it possible for algorithms to utilize pre-defined constraints (structure) to look for solutions with a set of known actions, states, and goals [1]. This language was first introduced in 1971 as a problem solver [2] and later formalized into a language with the same name.

STRIPS language helped to formalize research in the area of search and planning and gave birth to many successors that were later into Planing Domain Definition Language (PDDL). This formalization helped the development of Planning domain as it enabled comparison of research work and code reuse.

Planning Graph Analysis (GraphPlan)

GraphPlan is an approach to constructing and analyzing that significantly outperforms total-order and partial-order planners. GraphPlan represents search space as a graph where nodes represent both actions and facts. Representing a problem as a GraphPlan allows make many constraints explicit and reduce search space by eliminating nodes with incompatible constraints.

GraphPlan approach was introduced in Fast Planning Through Planning Graph Analysis research paper in 1997 [3]. The main drawback of this approach is the computational cost for problems with a high number of actions and facts.

Genetic Algorithms

Genetic algorithms were inspired by biological evolution process to find an optimal solution. Genetic algorithms rely on random search to solve optimization problems. Genetic algorithms use a heuristic that measures the fit of a potential solution to incorporate the knowledge of the domain space gained through random search by the agent. As a result, genetic algorithms combine benefits of both random search and informed search.

Genetic algorithms were first described by John Holland in the 1960s and later popularized in his book Adaptation in Natural and Artificial Systems [4]. Genetic algorithms are used in many fields of Artificial Intelligence including Classical Search and Machine Learning.

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