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AIND Project 3: Create a Domain-Independent Planner

Research Review on AI Plaaning Developments

The problem of planning has been explored as a sub-field of AI since the 1970s. From defining the classic planning problem to its applications in advanced technologies these days, AI planning has made great progress over the last few decades. This research review will cover a few major planning research and their influence on the development of AI planning.

STanford Research Institute Problem Solver (STRIPS)

Planning emerged as a sub-field of AI with the seminal work of Fikes and Nilsson [Fikes and Nilsson, 1971] on the STRIPS. The STRIPS system introduced the Strips assumptions as a way to simplify the Planning problem in situation calculus. They suggested that the only changes arise on application of an action to a situation are those that are explicitly mentioned as positive effects of the action. The STRIPS system introduced a language that defines action schemas, in terms of preconditions, add effects and delete effects. STRIPS is still used as a foundamental principle in the definition of planning problems today.

Planning Domain Description Languages (PDDL)

In planning problems, a plan can be seen as a sequence of state changes applied over time which transforms the initial state into the goal state. The PDDL[McDermott et al., 1998] is a language based on STRIPS assumptions and it supports the modelling of the dynamic process of planning problems by providing a compact representation of the finite state automation that describes its behavior. In this way, it shows an expressive power for modelling very complex realistic planning problems. It has been proposed as standards for modelling planning problems.

Graphplan

Graphplan[Blum and Furst, 1997] searches for a plan in two stages. It first constructs a plan graph that represents information about what propositions could be achieved by executing actions from the initial state. Then, it searches backwards from the goals for a path that can actually achieve the goal set without any incompatibility between individual goals. The preparatory step in Graphplan, where all the action parameters are instantiated with all possible values, although leads to a large memory cost, can be compactly encoded to a reasonable size. The idea of capturing all the possible propositions that could be achieved by applying increasing number of actions has led to many developments and applications. [Koehler et al., 1997] [Long and Fox, 1999]

References

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