Research Review

Project 3- Implement a planning search

Overview

This review is for the important historical developments in the field of AI planning and search. This a one-page report on three of these developments, highlighting the relationships between the developments and their impact on the field of AI as a whole. Following are the different planning and search key developments described.

1- State space search

State space search is a process used in the fields of AI mainly based on the state of an agent or programme to find the final state from given initial state.

In this method the complete problem can be divided into many state sets, and all other states are interconnected hypothetically, in other words from a given initial state one can use this method to get the next state of the problem and so to reach the final state of the problem.

As described in wikipedia "*State space search often differs from traditional computer science search methods because the state space is implicit: the typical state space graph is much too large to generate and store in memory. Instead, nodes are generated as they are explored, and typically discarded thereafter. A solution to a combinatorial search instance may consist of the goal state itself, or of a path from some initial state to the goal state.*"

2- Partial order planning

Partial order planning is the approach in automated planning by which we can plan for the partial order of any problem, and this partial order should be as open and intuitive as possible.

In partial order planning the exact order of actions can be determined if necessary.

A partial-order plan consists of four components:

- A set of **actions**.
- A **partial order** for the actions.
- A set of **causal links**.
- A set of **open preconditions**.

For example - A plan for making a tea can be like:

- Go to kitchen
- Get milk, sugar and dry tea.
- Heat milk
- Add tea and sugar
- Stop heating after 10 mins.

3- STRIPS

Standard Research Institute Problem Solver (STRIPS) is an automated problem solver developed by Richard fikes and Nils nilson. This name was later used for formal language of the inputs to this planner.

Wikipedia quotes about the formal language in its article as "*The above language is actually the propositional version of STRIPS; in practice, conditions are often about objects: for example, that the position of a robot can be modeled by a predicate and At(room1) means that the robot is in Room1. In this case, actions can have free variables, which are implicitly existentially quantified. In*

other words, an action represents all possible propositional actions that can be obtained by replacing each free variable with a value.

The initial state is considered fully known in the language described above: conditions that are not in are all assumed false. This is often a limiting assumption, as there are natural examples of planning problems in which the initial state is not fully known. Extensions of STRIPS have been developed to deal with partially known initial states."

A STRIPS instance is composed of:

- An initial state
- The specification of the goal states
- A set of actions.
    - preconditions
    - postconditions

Credits:

1- Wikipedia

2- Artificial Intelligence: A Modern Approach" 3rd edition by Stuart Russel and Peter Norvig

3- Udacity AIND lectures