Udacity Artificial Intelligence Nanodegree

Historical Advancements in Planning Algorithms

Research Review

Introduction

In this document, three major advancements and their key contributions in planning algorithms are presented.

STRIPS - 1971

Invented in 1971, by Richard Fikes and Nils Nilsson at Stanford Research Institute, STRIPS was the name for the planning component in software used in Shakey, the first general-purpose mobile robot to be able to reason about its own actions.

STRIPS defines a planning language that is composed from states, goals and set of actions. THe planning language described a set of applicable operators that allowed for transformation of one state into another. The method used was the initial implementation of what we now know as a “classical planning language”, and that is what makes STRIPS a key contributor to advances in AI research in the past decades.

Graphplan - 1997

Graphplan is an algorithm for automated planning developed by Avrim Blum and Merrick Furst in 1995. Graphplan takes as input a planning problem expressed in STRIPS and produces, if one is possible, a sequence of operations for reaching a goal state.

The use of a novel planning graph, to reduce the amount of search needed to find the solution from straightforward exploration of the state space graph is the key contribution this project made to the AI research community.

PPDL (Planning Domain Definition Language) - 1998

Inspired by STRIPS and ADL, the Planning Domain Definition Language (PDDL) was an attempt to standardize Artificial Intelligence (AI) planning languages. It was first developed by Drew McDermott and his colleagues in 1998, mainly to make the 1998/2000 International Planning Competition (IPC) possible, and then evolved with each competition. By defining an standard formal language for expressing planning problems and solution spaces, PPDL allows more direct comparison of systems and approaches and as a result support faster progress in the field by allowing research reuse and comparison.

References:

1. Richard E. Fikes, Nils J. Nilsson (Winter 1971). "STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving".

2. Stuart J. Russell, Peter Norvig (2010), Artificial Intelligence: A Modern Approach (3rd Edition).

3. Shakey the robot, Technical note 323, http://www.cs.uml.edu/~holly/91.549/readings/629.pdf