

Udacity Artificial Intelligence NanoDegree - Research Review

Fabio Quimio Pereira Fujii

May 22, 2018

The AI planning research was motivated by investigations into state-space search, theorem proving, and control theory and practical needs in the industry [RN16]. The AI planning enables better intelligent and clever automation for any complex domains in industry. The first major planning system was STRIPS (Stanford Research Institute Problem Solver) [NF70], used for the Shakey robot project SRI. The STRIPS system was built based on the GPS (General Problem Solver) proposed by [NSS59]. The concept behind the STRIPS is simple: the state-space is based on world models. It is assumed that there is a set of applicable operators, that transforms the world model into another world model. The final objective of the problem solver is find a composition of operators that transforms a given initial world model into one that satisfies the goal condition. The STRIPS uses Well formed formulas, which is based on first-order logic, to represent an operator.

In order to represent more realistic problems, the ADL (Action Description Language) was proposed [Ped89]. This approach relaxes some of the STRIPS limitations, enabling the representation of more realistic problems, which ADL represents only transformations inside the state. It is introduced four clauses into an action schema: Precond, Add, Delete and Update. Given an action schema: Precond is all conditions that must be satisfied before taking the action; the Add and Delete clauses are fluents that must be removed after taking that action; finally, the update clause is the application of the transformation into the state.

At last, the PDDL (Problem Domain description Language) [MGH⁺98] was introduced. PDDL enables a computer-parsable and standardized syntax for representing planning problems. At first, it was intended to be used on the IPC (International Planning Competition), and it got improved with each edition (currently at version 3.1). PDDL permits the user to input an domain description, actions and goals with ease.

References

- [MGH⁺98] Drew McDermott, Malik Ghallab, Adele Howe, Craig Knoblock, Ashwin Ram, Manuela Veloso, Daniel Weld, and David Wilkins. Pddl-the planning domain definition language. 1998.
- [NF70] Nils J Nilsson and Richard E Fikes. Strips: A new approach to the application of theorem proving to problem solving. Technical report, SRI INTERNATIONAL MENLO PARK CA ARTIFICIAL INTELLIGENCE CENTER, 1970.
- [NSS59] Allen Newell, John C Shaw, and Herbert A Simon. Report on a general problem solving program. In *IFIP congress*, volume 256, page 64, 1959.
- [Ped89] Edwin PD Pednault. Adl: Exploring the middle ground between strips and the situation calculus. *Kr*, 89:324–332, 1989.
- [RN16] Stuart J Russell and Peter Norvig. *Artificial intelligence: a modern approach*. Malaysia; Pearson Education Limited,, 2016.