

We will review three developments in Planning Search that impacted AI as a whole.

STRIPS

The automated planner developed and the formal language it used, is a true corner stone in Planning.

It provided the framework to attack a classical planning problem that was paradigmatic enough to tackle the most fundamental questions of the time about AI (Fikes and Nilsson, 1993). It mainly allowed the creation of automatically generated plans based on heuristics. It is important to note STRIPS contributed with a technical representation of a macro-operators that generates new states under the assumption that only those operators only affect the those aspects explicitly noted under the effects conditions.

It was intuitive enough to make it appealing to researchers that later formalize the ideas and generalize the plan.

It also introduce goal-oriented search that allow to regress over certain actions and asking if a particular state achieves the goal.

It fails to account for non-deterministic states in which it is not certain readings are correct or state change caused by actions are not immediate.

Why is it important?

STRIPS as a language originated most of automated planning languages in used these days. It created the concept of initial states, conditions, operators and goals we now used.

Shakey the robot

This project being the first general purpose robot was a major milestone in AI and robotics.

Its logic was based on a set of high level commands the robot would then parse on a low-level set of actions (SRI international,2017)

Its ability to move in a control environment a search for the best plan to achieve a given goal was based on STRIPS language.

It used a limited view of the world using its sensors in a safe environment with a group of actions to execute.

One of the modules it used, called Model of the World, was a set of conditions that mapped the environment surround it, then

it used the it used STRIPS to find a sequence of actions and also the consequences of those actions in the model.

In other words STRIPS needed to have the set of effects modeled to be able to perform the actions generating them (Nilsson,1984)

STRIPS uses QA3 algorithm for goal testing and if the result is false it tries to find an action that will lead to that result.

It will then recurse the possible states until goal is fulfilled.

Why is it important for AI?

Because it lead to the creation of A* search algorithm one of the earliest heuristic-based (informed) searches that is complete and optimal.

It introduced the Hough transform a feature extraction technique pioneering computer vision.

Planning Domain Definition Language (PDDL)

This technique is intended to define a standardized language that allows the representation of STRIPS, ADL and other languages that can be parsed programmatically (Russell and Norvig, 2010).

PDDL intends to offer a framework for comparison between different planning techniques by defining: STRIP-like actions, conditional effects, compound-action hierarchies.

It prizes neutrality and does not provide a particular advise mechanism to track which actions to choose for a particular goal (Ghallab et. al. 1998).

It allows for a clear separation of a domain description and a problem description. The domain description is analogous to object-oriented programming (hierarchies, constants and predicates).

The problem description is formed by objects, initial conditions and goal states.

Why is it important?

Formalizing the definition of a domain and problem for planning allows researchers from different areas to share techniques and tools, facilitating breakthroughs in their field.

Consequently, it is not a surprise PDDL reached 3.1 versions and influenced successors and extensions.

References:

1998 Planning domain definition language Versin1.2

Ghallab et. al.

Yale Center for Computational Vision and Control.

1966 'Shakey the robot'

[https://www.sri.com/work/timeline-innovation/timeline.php?timeline=computing-digital#!](https://www.sri.com/work/timeline-innovation/timeline.php?timeline=computing-digital#!&innovation=shakey-the-robot)

&innovation=shakey-the-robot

SRI International

1984 'Shakey the robot - Technical note 323'

Nils J. Nilsson

<http://www.cs.uml.edu/~holly/91.549/readings/629.pdf>

2010, 'Artificial Intelligence, a modern approach'

S. Russell & P. Norvig

1993, 'STRIPS, a retrospective'

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