Historical developments in the field of AI planning and search

- Planning is a sub-field of Artificial Intelligence (AI), explored by researchers in the AI community for more than three decades .
- The first step of building a planner was by Fikes and Nilsson [Fikes/Nilsson 1971] on the Stanford Research Institute Problem Solver (STRIPS).

1- **STRIPS** project introduced a simple syntax for defining action schemas, in terms of the preconditions, add effects and delete effects of the action.

2- Planning Graphs

- After that an improvement was done, the idea was: Instead of greedily searching for a solution from the start, the GraphPlan algorithm constructs a Planning Graph object which can be used to obtain a solution, The Planning Graph is useful because it inherently encodes useful constraints explicitly, thereby reducing the search overhead in the future.
- The algorithm guarantees that the shortest plan will be found.

3-Heuristic Search Planner (HSP)

- HSP is based on the idea of heuristic search. A heuristic search provides an estimate of the distance to the goal.
- The results seem slightly better. The heuristic exploited by HSP is admissible (it never over-estimates the distance to the goal) unlike GraphPlan based heuristic which was inadmissible.

Action LOAD ?object ?container ?location

Precondition:
at(?object,?location)
at(?container,?location)
empty(?container)

Add:
inside(?object,?location)

Delete:
at(?object,?location)
empty(?container)

Action UNLOAD ?object ?container ?location

Precondition:
at(?container,?location)
inside(?object,?location)

Add:
at(?object,?location)

Delete:
inside(?object,?container)
empty(?container)

Action MOVE ?container ?start ?destination

Precondition:
at(?container,?start)
link(?start,?destination)

Add:
at(?container,?destination)

Delete:
at(?container,?start)

Initially:
at(PickUp,Home)
at(Box,Office)
link(Home,Town)
link(Town,Home)
link(Town,Office)
link(Office,Town)

Goal: at(Box,Home)

Example of STRIPS problem description

Sources:

Progress in AI Planning Research and Applications [link]

STRIPS

Planning Graph

HSP