

In 1971, Richard Fikes and Nils Nilsson developed an automated planner, called STRIPS short for Stanford Research Institute Problem Solver^[1]. STRIPS is served as the base of most of the languages which are known as action description languages (ADL). The descriptions of the real-world problem by using these kinds of languages consists of 3 fundamental parts, including initial state, goal state and a set of actions indicating the preconditions and post-conditions. In order to be more standardized and computer-parsable, PDDL which stands for Problem Domain Description Language has been adopted. Similar to STRIPS and ADL, its problem description is mainly composed of the initial state, the actions which contains preconditions and effects, the result of an action, and the goal test. As PDDL gradually develops, a proposal for providing better metrics to calculate the quality of a plan is made in PDDL3 in 2005^[2]. It allows to express “Strong” and “Soft” problem goals which would be closer to the real-world problem. Within this domain, strong means the goal must be satisfied by any valid plan while soft means there is a desired constraint or goal which would not have to be achieved. Besides, the metrics for soft constraint and goal are applied in PDDL3. Each soft constraint and goal is associated with a numerical weight representing the cost of its violation in a plan. With this kind of weight or metrics, it can be expressed that certain plans are more preferred than others. For instance, by weighting a failure to use all the planes by a number 100 times bigger than the weight associated with fuel use in the plan metric could express the preference of a plan where every airplane to a plan using 100 units of fuel less.

Aside from development in description languages of planning problem, the way to search an optimal plan also advances with time. UNPOP program used ignore-delete list heuristic for state-space search and denoted the resurgence of interest in state-space search while FASTDOWNWARD is a forward state-space search planner that preprocesses the action schemas into an alternative representation which makes some of constraints more explicit^[3]. LAMA, which is based on FASTDOWNWARD, applies cost-sensitive heuristics to get higher quality plans. These heuristics estimates are derived from Landmarks, which are propositional formulas that have to become true at some point in every plan for the task at hand. With these mentioned above, LAMA solved more problems and got shorter solution paths^[4].

References

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