Research Review:
The Fast Downward Planning System

This article introduced a classical planning system, which called Fast Downward. It is able to deal with general deterministic planning problems. These problems encode in the propositional fragment of PDDL2.2. Similar with other planners (HSP, FF), Fast Downward is a progression planner. It searches the space of world states of a planning task in the forward direction.

Nevertheless, different with other planning systems, the Fast Downward does not use the propositional PDDL representation, but the input is first translated into an alternative representation, which is something called multivalued planning task explicit. The Fast Downward planning system uses a special heuristic function, called the causal graph heuristic. The causal graph heuristic is a very different with traditional HSP-like heuristics that based on ignoring negative interactions of operators.

In order to solve multiple valued planning tasks, the article provide a full account of approach of Fast Downward. Continue with the causal graph heuristic that mention earlier in the article. It also extend that earlier discussion of the causal graph heuristic to tasks involving axioms and conditional effects and present some novel techniques for search control that are used within the Fast Downward best first search algorithm. The Fast Downward best first search algorithm preferred operators transfer the idea of helpful actions from local search to global best-first search, deferred evaluation of heuristic functions mitigates the negative effect of large branching factors on search performance, and multi-heuristic best-first search combines several heuristic evaluation functions within a single search algorithm in an orthogonal way.

In addition, the article demonstrate efficient data structures for fast state expansion, which also known as successor generator and axiom evaluators. It presents a new non-heuristic search algorithm, which called focused iterative broadening search. The focused iterative broadening search is able to utilize the information that encoder in the causal graphs. It is a very important theory in the planning system.