Research Review

1. J. Hoffmann and B. Nebel (2001) "The FF Planning System: Fast Plan Generation
2. M. Helmert (2006) "The Fast Downward Planning System", Volume 26, pages 191-246
3. S. Richter and M. Westphal (2010) "The LAMA Planner: Guiding Cost-Based Anytime Planning with Landmarks", Volume 39, pages 127-177

"The FF Planning System: Fast Plan Generation Through Heuristic Search" presented an domain independent approach that outperform all existing technology at the time. The FF planning system relies on forward state space search and heuristic evaluation of states by ignoring delete lists [1]. It uses a GRAPHPLAN style algorithm to find an explicit relaxed solution to each search state [1]. This is a major difference to the existing HSP system. FF Planning system also differs from HSP by employing a novel local search strategy, combining hill climbing with complete search. It uses heuristic pruning techniques based on examining relaxed solution. The FF planning system is the most successful state-space searcher to date [4]. It is the winner of the AIPS 2000 planning competition.

Like FF, FASTDOWNWARD is a progression planner, searching the space of states in the forward direction. However, FASTDOWNWARD does not use the propositional PDDL representation of a planning task directly. The input is first translated into an alternative representation called multi-valued planning tasks [2]. FASTDOWNWARD then uses hierarchical decomposition of planning tasks for computing its heuristics function called causal graph heuristic [2]. FASTDOWNWARD is proven to be remarkably successful. It won AIPS 2004 planning competition following the step of FF planning system.

LAMA is a planning system based on heuristic state space search in the spirit of FF [3] and FASTDOWNWARD. It showed best performance among all planners in the sequential satisficing track of the International Planning Competition 2008. LAMA inherits the general structure of FASTDOWNWARD. Core features of LAMA are the use of landmarks a heuristic combined with FF heuristic and for generating preferred operators [5]. It uses finite domain rather than binary state variables and multi-heuristic search. A weighted A∗ search is used with iteratively decreasing weights, so that the planner continues to search for plans of better quality until the search is terminated [5].

Planning research has been central to AI since its inception [4]. The aforementioned three algorithms significantly improved state-space search practical for large planning problems.

Reference:

[1] J. Hoffmann and B. Nebel (2001) "The FF Planning System: Fast Plan Generation Through Heuristic Search", Volume 14, pages 253-302
[2] M. Helmert (2006) "The Fast Downward Planning System", Volume 26, pages 191-246
[3] S. Richter, M. Westphal and MHelmert (2011) “LAMA 2008 and 2011”
[4] S. Russell and P. Norvig (2010) “Artificial Intelligence. A Modern Approach 3rd Edition”
[5] S. Richter and M. Westphal (2010) "The LAMA Planner: Guiding Cost-Based Anytime Planning with Landmarks", Volume 39, pages 127-177