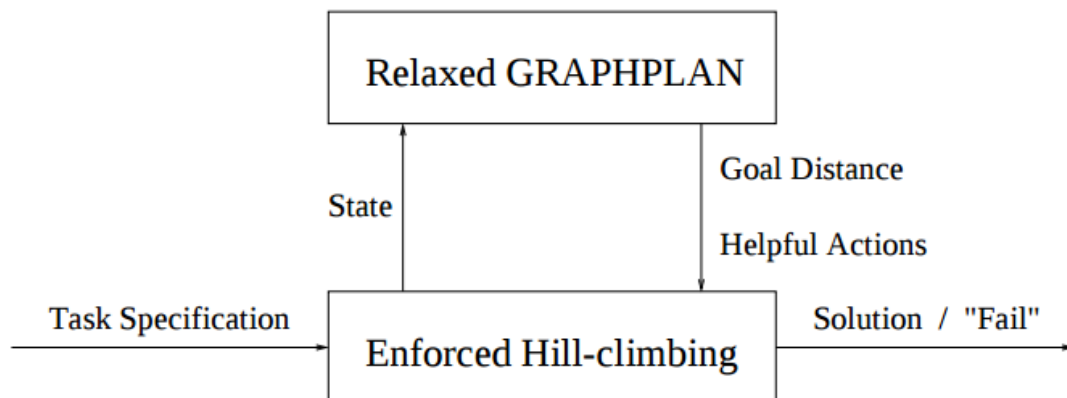


# Research Review

## FF Planning System

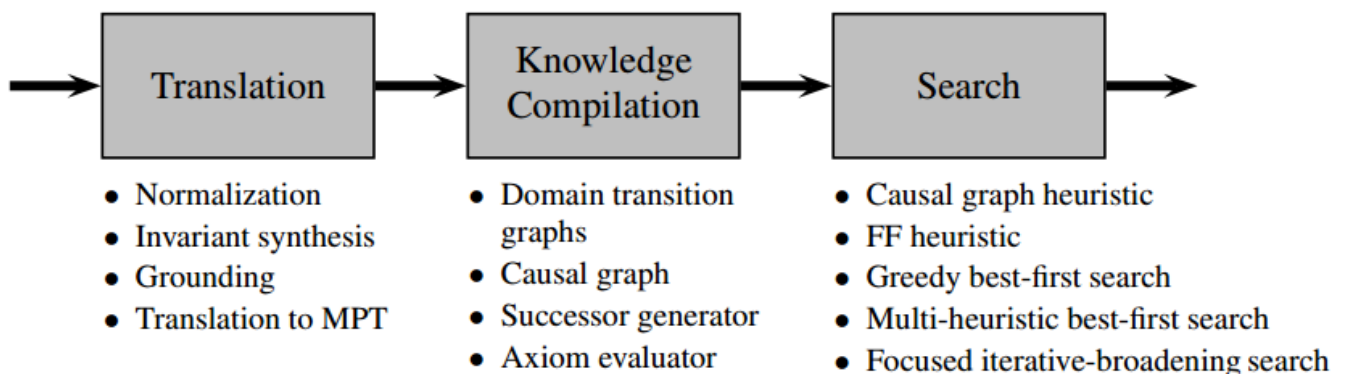
- Article: <http://www.cs.toronto.edu/~sheila/2542/s14/A1/hoffmanebel-FF-jair01.pdf>
- Winner of classical track of International Planning Competition at ICAPS 2000.



- The fundamental heuristic technique in FF is relaxed GRAPHPLAN. The technique gets called on every search state by enforced hill-climbing, a forward searching engine. Given a state, relaxed GRAPHPLAN informs the search with a goal distance estimate, and additionally with a set of promising successors for the state, the helpful actions. Upon termination, enforced hill-climbing either outputs a solution plan, or reports that it has failed.
- The enforced hill-climbing starts out in the initial state. Then, facing an intermediate search state  $S$ , a complete breadth first search starting out from  $S$  is invoked. This finds the closest better successor  $S_0$ . The path from  $S$  to  $S_0$  is added to the current plan, and search is iterated. When a goal state is reached, search stops.

## FastDownward Planning System

- Article: <http://gki.informatik.uni-freiburg.de/papers/helmert-jair06.pdf>
- Winner of classical track of International Planning Competition at ICAPS 2004.



- It contains 3 phases: Translation, Knowledge compilation and search.
- In translation phase, the problem is translated into "multi-valued planning tasks" for better searching.
- In knowledge compilation phase, the critical information about the planning task is compiled into a number of data structures for efficient access. Domain transition graphs, causal graph, successor generator and Axiom evaluator is built for searching phase.
- Several search algo can be choosed: Greedy best first search, Multi-heruistic best first search and Focused iterative-broadening search.

## LAMA Planner

- Article: <http://www.jair.org/media/2972/live-2972-5181-jair.pdf>
- Winner of classical track of International Planning Competition at ICAPS 2008.
- Based on FastDownward Planning System
- Causal graph heurisc is replaced with new heurisc derived from landmarks.
- LAMA weighs the estimated cost-to-go (as a measure of plan quality) against the estimated goal distance (as a measure of remaining search effort) by combining the values for the two estimates.
- After finding an initial solution with a greedy best-first search, it conducts a series of weighted  $A^*$  searches with decreasing weights, restarting the search each time from the initial state when an improved solution is found.