Project 3: Research review

By Paula Martínez

Several approaches to plan search have been proposed. On this research I have studied three relevant papers on the subject.

Fast Planning Through Planning Graph Analysis

They introduce a new planner, the "Graphplan" on the STRIPS-like domain. The algorithm constructs a compact structure, a "Planning Graph".
"A Planning Graph encodes the planning problem in such a way that many useful constraints inherent in the problem become explicitly available to reduce the amount of search needed."

This algorithm takes notions form standard total order and partial order planners, but represents the problem and the explicit the constraints in a graph structure, and because of this they can improve efficiency.
The provide empirical evidence on several domains showing that Graphplan provides improvements in running time. And they believe that combining this approach with heuristics will bring more significant gains.

On the Use of Integer Programming Models in AI Planning

On this paper is explored the application of Integer programming (propositional reasoning) to solve AI planning problems. The advantage is that can be easily added numeric constraints and objectives into the planning domain. The technique used to solve Integer programming is linear programming relaxation. This work is also based on STRIPS-like domains and their objective was to show that choosing carefully the integer programming formulation can be use to solve AI planning problems. They found that the formulation has the potential to do efficient planning.

Planning with incomplete information as Heuristic search in belief space

When planning in incomplete information, the initial state space may not be fully known, but sensors information may be available at execution time. The novel approach introduced on this paper is to make explicit to test over a number of domains, and to extend planning with sensing (contingent and conformant planning) to standard search algorithms. They view conditional and probabilistic planning as an heuristic search on belief space.

References:

- Fast Planning Through Planning Graph Analysis [Blum and Furst, 1997] https://www.cs.cmu.edu/~avrim/Papers/graphplan.pdf
- On the Use of Integer Programming Models in AI Planning [Vossen et al., 1999] http://www.cs.umd.edu/~nau/papers/vossen1999use.pdf
- Planning with incomplete information as Heuristic search in belief space [Bonet and Geffner, 2000] http://rakaposhi.eas.asu.edu/cse574/aips00-incomplete.pdf