

Research Review

Dovydas Čeilutka

January 6, 2018

In this research review three important developments in the classical planning are analysed and their impact on the artificial intelligence field is summarized. SATPlan, Graphplan and Blackbox planning systems and their influences are reviewed.

1 SATPlan

SATPlan was the first planning strategy, which implemented the idea that planning problems can be tackled as a general propositional satisfiability problems instead of deduction problems and did not require specialized algorithms to solve (H. A. Kautz, Selman, et al. 1992; H. Kautz and Selman 1996). Moreover, SATPlan was more flexible and as performant as the best of the specialized planning systems. The use of logical representation that has good computational properties and powerful algorithms such as Walksat were the two major factors, which led to the success and popularity of the SATPlan system (H. Kautz and Selman 1999). SATPlan takes a set of axiom schemas as its input and creates a general conjunctive normal form to represent the mutex relationships.

2 Graphplan

Blum and Furst 1997 presented a new graph-planning system called Graphplan, which was much faster than the state of the art partial-order planning algorithms, which were the most popular type of planning algorithms at that time (Russell and Norvig 2010). What made the Graphplan unique is the fact that the algorithm would first construct a planning graph instead of trying to find the solution right away like other planning methods. The planning graph can be constructed very quickly (in polynomial time), do not take up much space (polynomial size) and allows the reduction of the constraints of the problem due the way they are encoding the problem. SATPlan and Graphplan systems were quite similar and the main practical difference is how each of the systems create the propositional structure: Graphplan creates a plan graph and SATPlan creates a CNF wff (H. Kautz and Selman 1999).

3 Blackbox

The Blackbox planning system combined the best features of Graphplan and SATPlan (H. Kautz and Selman 1999). The authors show that this combination has superior performance than each of its predecessors.

4 The impact on the AI field

Planning problems are very important part of the artificial intelligence field (Russell and Norvig 2010). SATPlan and Graphplan were very powerful planning systems, which fundamentally changed how the planning problems are solved. Blackbox is an improvement on these systems, which takes the best ideas from both and thus has superior performance than either one of its predecessors.

References

- Blum, Avrim L and Merrick L Furst (1997). “Fast planning through planning graph analysis”. In: *Artificial intelligence* 90.1, pp. 281–300.
- Kautz, Henry A, Bart Selman, et al. (1992). “Planning as Satisfiability.” In: *ECAI*. Vol. 92, pp. 359–363.
- Kautz, Henry and Bart Selman (1996). “Pushing the envelope: Planning, propositional logic, and stochastic search”. In: *Proceedings of the National Conference on Artificial Intelligence*, pp. 1194–1201.
- (1999). “Unifying SAT-based and graph-based planning”. In: *IJCAI*. Vol. 99, pp. 318–325.
- Russell, Stuart J and Peter Norvig (2010). *Artificial Intelligence (A Modern Approach)*.