Research review of AI planning

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1 Discussion

In this review, I discuss three important historical developments in the field of AI planning.

The GRAPHPLAN planning algorithm

Avrim Blum and Merrick Furst[1] first introduced the GRAPHPLAN algorithm to planning by constructing a data structure called a planning graph. They showed that the GRAPHPLAN algorithm always returns a shortest-possible partial-order plan if such a valid path exists. The GRAPHPLAN algorithm turns out to be a polynomial algorithm.

The SATPLAN planning algorithm

Kautz and Selman[2] formulated the planning problem as a satisfiability problem instead of a deduction problem. They showed that the satisfiability approach not only provides a more flexible framework in interpreting constraints on plans, but also captures the theory behind constraint-base planning problems. It is also easier to specify intermediate states.

Integer programming in planning

Vossen[3] surveyed the use of integer programming in planning. Integer programming can easily incorporate numerical constraints in the planning problem. They showed that a carefully chosen IP formulation of the planning problem can improves the LP relaxation of the planning problem. They also showed that the number of nodes expanded in the search space is smaller, compared to a satisfiability solver, another advantage of using IP.

References

[1] Avrim L. Blum and Merrick L. Furst. Fast planning through planning graph analysis. *Artificial Intelligence*, 90:1636–1642, 1997.

[2] Henry Kautz and Bart Selman. Planning as satisfiability. In *Proceedings of the 10th European Conference on Artificial Intelligence*, ECAI '92, pages 359–363, New York, NY, USA, 1992. John Wiley & Sons, Inc.

[3] Thomas Vossen, Michael Ball, and Robert H. Smith. On the use of integer programming models in ai planning. In *In Proceedings of the Sixteenth International Joint Conference on Artificial Intelligence*, pages 304–309. Morgan Kaufmann, 1999.