Research Review

AI planning have been as a research field for 50 years, so there are lots of concepts, representations and algorithms over the years. Beside of them, there are important real-world applications of AI planning and scheduling which influenced many fields as space, manufacturing, housebuilding etc. On the purpose of gaining insight on these applications and effects, we will take a glance at NONLIN, O-PLAN and Optimum-AIV respectively.

Firstly, NONLIN is a consolidation of Hierarchical Task Network (HTN) Planner, Partial Order Planner and Plan Space Planner introduced in 1976 and used for used for and housebuilding (20-60 jobs) later. The NONLIN Planer used “Goal Structure” as a meta-planning aid to resolving conflicting parallel actions in nonlinear planners and planning hierarchically. NONLIN also introduced Task Formalism used to describe a problem domain to the planner. It is tried on technically difficult problems in simple domains like block stacking. [1]

O-PLAN is formed as combining HTN planning with scheduling in 1985 by Bell and Tate to use in production plans for Hitachi. A typical problem involves a product line of 350 different products, 35 assembly machines, and over 2000 different operations. The planner generates a 30-day schedule with three 8-hour shifts a day, involving tens of millions of steps. [2] For these days, this is quite large problem. O-Plan uniformly represented time constraints (and resource usage) by a numeric (min, max) pair that bounded the actual values for activity duration, activity start and finish times, and delays between activities. The actual values can be uncertain for various reasons, such as the plan being at a high abstraction level, not having chosen values for objects referred to in the plan, or uncertainty existing in modelling the domain. Constraints can be stated on the time and resource values that can lead to the planner finding that some plans in its search space are invalid. [3]

The last but not the least, Optimum-AIV is introduced in 1991 by the European Space Agency (ESA) for planning of the Ariane Rocket payload bay. Its design was also based on O-Plan algorithms. It is customized planning tool for space projects. It can define an `activities network' associate minimum and maximum delay constraints between activities, allocate shared or consumable resources to activities, and compute a schedule which meets these temporal and other resource constraints. Optimum-AIV also has an automatic mode to compute the schedule and to resolve conflicts of demand for resources. [4]

Although all these three practical planners are not famous nowadays, they have a significant role in AI planning and scheduling history.

REFERENCES

[1] Tate, A. (1976) "Project Planning Using a Hierarchic Non-linear Planner", D.A.I. Research Report No. 25, August 1976, Department of Artificial Intelligence, University of Edinburgh.

[2] Russell, Stuart J. and Norvig, Peter. Artificial Intelligence: A Modern Approach (2nd Edition). : Prentice Hall, 2002.

[3] Hendler J., Tate A. and Drummonf M. (1990) " AI Planning: Systems and Techniques", AI Magazine, Volume 11,Number 2.

[4] Arentoft, M.M., Parrod, Y., Stader, J., Stokes, I. and Vadon, J. (1991) OPTIMUM-AIV: A planning and scheduling system for spacecraft AIV, Telematics and Informatics, Volume 8, Issue 4, 1991, Space Applications of Artificial Intelligence, Pages 239-252.