Research Review

In this research view, we are going to talk about early development of problem planning language and system.

In [1], it proposed STRIPS (STanford Research Institute Problem Solver) which was the first major planning system illustrating the interaction between state-space search, theorem proving and control theorems. It is a member of the class of problem solvers that search a space of "world models" to find one in which a given goal is achieved. It successfully solved general-purpose problem for robot tasks. For example, it solved the problem on how the robot can moves boxes from different locations to the same place, how to turn on the light switch and how to move from one room to another room. The representation language used by STRIPS has been far more influential than its algorithmic approach in structuring planning problems and latter it helped to lead to the development of ADL (Action Description Language).

In [2], it demonstrates how some multi-agent, dynamic-world planning problems may be formulated as single-agent, static-world problems, thereby permitting them to be solved with techniques originally intended for the latter. In order to describe actions and their effects, the paper proposed a language named ADL (Action Description Language) which combines the notational convenience of the STRIPS operator language with the semantics and expressive power of the situation calculus. Therefore, ADL has the same facilities as the STRIPS language for coping with the frame problem. However, it is a more expressive language in that it permits actions to be described whose effects change according to the circumstances under which they are performed. In addition, ADL overcomes the semantic pitfalls of the STRIPS language. This work latter was extended to handle partial order plans in [3].

In [3], it proposed a general and mathematically rigorous approach to nonlinear planning that handles both complex goals and actions with context-dependent effects. It can be used to solve a wider range of problems than previous approaches to nonlinear planning. The approach is an extension based on previous work by the author on linear planning. The same mathematical framework is used with the results extended to nonlinear plans and this paper bridges the gap existing in the generality of the formal results obtained for linear and nonlinear planning methodologies. The extension preserves the range of problems that can be solved while taking advantage of the ability of partial orders to represent several possible sequences of actions simultaneously. This ability can potentially make the nonlinear approach more attractive than the linear method upon which it is based.

In short, these developments helped to extend the scope of problems that can be solved by AI and built the foundation for more efficient and powerful planning algorithms developed afterwards.

Reference:

[1] STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving (Fikes and Nilsson, 1971)

[2] Formulating multi-agent dynamic-world problems in the classical planning framework (Edwin P.D. Pednault 1987)

[3] Generalizing Nonlinear Planning to Handle Complex Goals and Actions with Context-Dependent Effects ((Edwin P.D. Pednault 1991)