Literature Summary

This literature summary aims to provide an overview of the key development in planning and its contribution to the advancement of the field of Artificial intelligence as a whole.

More specifically, this article is going to cover three primary developments in logic-planning:

- The invention of Problem Domain Description Language, or (PDDL)
- The development of and reemergence of state-space planning
- The development of GraphPlan system

Problem Domain Description Language (PDDL)

In order for AI researchers to communicate complex problems effectively, an efficient language need to be invented to represent complex states with simple syntax.

The first attempt at this challenge was STRIPS by Fikes and Nilsson in 1971 (Fikes & Nilsson, 1971). Even though not entirely intended to invent a planning language, the primary contribution STRIPS had to the field of AI was that the representation used in its algorithm, which served as a basis of modern "classical" planning languages.

The next stage of the development came in the form of Action Description Language (Pednault, 1986), which relaxed a lot of restrictions in STRIPS and made it more real-world compatible.

Based on the previous work of STRIPS and ADL, in 1998 Ghallab et al proposed PDDL, which serves as the first standardized language for representing planning programs that is also computer readable (Ghallab et all, 1998), the PDDL have been used since for planning problems, and is currently in its 7^{th} iteration at PDDL3.1.

State-Space Planning

Another major challenge in planning have been choosing among multiple planning approaches including but are not limited to linear planning, partial order planning, goal-regression planning, and state-space planning.

Even though hints of state-space planning have been used in a somewhat primitive form in the original version of STRIP (Fikes & Nilsson, 1971), it fell out of favor due to its need for good heuristics to perform optimally.

Eventually, in 1990s, it replaced formerly popular partial-order planning due to emergence of higher computing power and researcher's need of faster methods. The first major develop of state-space planning method was the UnPOP program (Drew McDermott, 1996), which established the foundation for the current ignore-delete-list heuristic, in large part resolved the need-for-heuristic problem.

Then, the beginning of the 21st century can be described as the age of state-space planning, with invention of Heuristic Search Planner enabled state-space search for large planning problems (Bonent and Geffnet, 1999; Haslum et al., 2005, Haslum, 2006), and multiple different versions of state-space based systems (FF(Hoffmann, 2001), FastDownward(Helmert, 2006)) winning search competitions in 2000, 2004, and 2008.

This development is significant for modern AI because state-space planning right now still sits at the foundation of all modern search methods.

GraphPlan System

GraphPlan system was another attempt to improve the speed of planning. It was originally developed by Blum and Furst in 1995 and used a planning graph as a simple heuristic for faster planning.

The big thing about Graphplan is that it is propositional, meaning that there are no variables around in the course of planning other than the graph itself. This makes planning and implementation much simpler than the planners before it.

Even though, compare with the previous two developments, the invention of the GraphPlan system is less significant in the history of AI development. However, it still offered a new, and many argue a simpler way for us to consider solving the planning solution, and a graph-based planner won the 2002 AIPS planning competition (Gerevini and Serina, 2002, 2003).