

*Write a one-page report on three of these developments important historical developments in the field of AI planning and search, highlighting the relationships between the developments and their impact on the field of AI as a whole.*

(Source)

*“Artificial Intelligence: A Modern Approach”* by Norvig and Russell, in the Bibliographical and Historical notes at the end of Chapter 10

AI planning arose from investigations into state-space search, theorem proving, and control theory and from the practical needs of robotics, scheduling, and other domains. STRIPS (Fikes and Nilsson, 1971), the first major planning system, which was designed as the planning component of the software for the robot project at SRI. The Action Description Language, or ADL (Pednault, 1986), relaxed some of the STRIPS restrictions and made it possible to encode more realistic problems. Nebel (2000) explores schemes for compiling ADL into STRIPS as The Problem Domain Description Language, or PDDL (Ghallab *et al.*, 1998). It realized computer-parsable, standardized syntax for representing planning problems.

Planners in the early 1970s considered Problem decomposition which resulted partial-order planning, introduced by Waldinger (1975) and Warren's (1974). Warren's WARPLAN was the first planner to be written in a logic programming language (Prolog). The ideas underlying partial-order planning include the detection of conflicts (Tate, 1975a) and the protection of achieved conditions from interference (Sussman, 1975). Partial-order planning dominated the next 20 years of research.

Partial-order planning fell out of favor in the late 1990s as faster methods emerged. Nguyen and Kambhampati (2001) suggest that a reconsideration is merited: with accurate heuristics derived from a planning graph, their REPOP planner scales up much better than GRAPHPLAN in parallelizable domains and is competitive with the fastest state-space planners. Also, the state-space planning was pioneered by Drew McDermott's UNPOP program (1996), which was the first to suggest the ignore-delete-list heuristic. Bonet and Geffner's Heuristic Search Planner (HSP) and its later derivatives (Bonet and Geffner, 1999; Haslum *et al.*, 2005; Haslum, 2006) were the first to make state-space search practical for large planning problems. HSP searches in the forward direction while HSPR (Bonet and Geffner, 1999) searches backward. The most successful state-space searcher to date is FF (Hoffmann, 2001; Hoffmann and Nebel, 2001; Hoffmann, 2005), winner of the AIPS 2000 planning competition. FASTDOWNWARD (Helmert, 2006) is a forward state-space search planner that preprocesses the action schemas into an alternative representation which makes some of the constraints more explicit.

(End)