Historical developments in the field of AI planning and search.

AI planning arose from investigations into state-space search, theorem proving and control theory to be applied to the needs of robotics, scheduling, etc.

STRIPS (Fikes and Nilsson, 1971) was the first major planning system and it illustrates the interaction of these influences. STRIPS was designed as the planning component of the software for the Shakey robot project at SRI. It's overall control system was modeled on the one of GPS, the General Problem Solver (Newell and Simon, 1961), a state-space search system that used means-ends analysis. The representation language used by STRIPS can be called the "classical" language considering its influence.

Planners in early 1970s generally considered totally ordered action sequences. Problem decomposition was achieved by computing a subplan for each subgoal and then putting the subplans together in some order. This approach,called linear planning by Sacerdoti (1975), was soon discovered to be incomplete – it cannot solve some very simple problems, such as Sussman anomaly, found during experiments with the HACKER system (Sussman, 1975). A complete planner must allow for interleaving of actions from different subplans within a single sequence.

One solution to the interleaving problem was goal-regression planning, a technique in which steps in a totally ordered plan are reordered so as to avoid conflict between subgoals (Waldinger, 1975).

Partial-order planning (construction of task networks) was pioneered by the NOAH planner (Sacerdoti, 1975, 1977) and by Tate's (1975b, 1977) NONLIN system. It dominated for the next 20 years of research. It fell out of favor in the late 1990s as faster methods emerged.

In the late 90s the resurgence of interest in state-space planning was pioneered by Drew McDermott's UNPOP program, which was the first to suggest the ignore-delete-list heuristic. The name was chosen as the reaction to the overwhelming concentration on partial-order planning at the time. Bonet and Geffner's Heuristic Search Planner (HSP) and its later derivatives (Bonet and Geffner, 1999; Halsum 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.

There are now some interesting comparisons of the various approaches to planning. Helmert (2001) analyzes several classes of planning problems, and shows that constraint-based approaches such as GRAPHPLAN and SATPLAN are best for NP-hard domains, while search-based approaches do better in domains where feasible solutions can be found without backtracking. GRAPHPLAN and SATPLAN have trouble in domains with many objects because that means they must create many actions. In some cases the problem can be delayed or avoided by generating the propositionalized actions dynamically, only as needed, rather than instantiating them all before the search begins.