According to Artificial Intelligence A Modern Approach "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" pg. 393 (AIMA).

The Stanford Research Institute Problem Solver (STRIPS) was designed to enable robots to efficiently navigate and rearrange object. Unlike games or puzzles, the software needed to encode various facts and relations of the world so the robot knew how to interact with its environment. To accomplish this STRIPS represents a model as "a collection of first-order predicate calculus formulas" pg.1 (A New Approach to the Application of Theorem Proving to Problem Solving) where it attempts to reduce the difference between the current and final state to reach its goal.

STRIPS representative language was highly influential for its ability to represent the world as first-order logic. This approach paved the way for the Action Description Language ADP and more recently the Problem Domain Description Language (PDDL) used today for how to store a state model and logically conclude how state-actions follow from logical reasoning.

In the mid-late 90's GraphPlan made another major breakthrough in the planning field by incorporating constraints in a compact graph structure. Unlike other planning algorithms GraphPlan stores and propagates constraints of the problem in a graph data structures thereby considerably reducing the search space needed using STRIPS-like representative language that include time steps. This allows the graph to incorporate several actions in parallel assuming no interference effects. The algorithm starts with an initial condition proposition where at each time step it expands the graph to find a potential plan. If solution found it is guaranteed to be optimal.

While GraphPlan does not deal with uncertainty very well, it has paved the way for efficient planning systems that can incorporate total and partial planning with parallelizable actions sequences. This is due to its ability to record time steps, record past subgoals and propagate mutually exclusive actions to reduce search time.

To deal with uncertainty, conformant planning systems were constructed to handle non-deterministic worlds by "finding a sequence of actions that guarantee to achieve the goal regardless of the non-determinism of the domain" pg.1 (Conformant Planning via Symbolic Model Checking). This approach involves backward breadth-first search that checks if any plan of zero length exists. Otherwise, for each iteration, a conformant plan of increasing length is explored. The algorithm ends when a solution path is discovered or the space of possible paths is completely explored.

To optimize this approach, symbolic model checking is implemented using a binary decision diagram. A binary decision diagram is a directed acyclic graph where non-terminal nodes represent boolean variables that allow it to represent a set of state transitions into a compact and efficient representation. This makes it possible to compactly and efficiently manipulate despite a potentially large degree of transition states that can arise from uncertainty.

While this algorithmic approach is relatively new, it appears to handle uncertainty relatively well whereas graph planning's enumerative approach to uncertainty dramatically affects performance. The new direction might perhaps lead researchers to consider world models using symbolic approaches in more realistic environments where there will always be some non-determinism in each action.

Russell, Stuart, and Peter Norvig. Artificial Intelligence: A Modern Approach. Pearson, 2009.

Fikes, Richard E., and Nils J. Nilsson. "Strips: A New Approach to the Application of Theorem Proving to Problem Solving." Artificial Intelligence, vol. 2, no. 3-4, 1971, pp. 189–208., doi: 10.1016/0004-3702(71)90010-5.

Blum, Avrim L, and Merrick L Furst. “Fast Planning Through Planning Graph Analysis.”Artificial Intelligence, 90:281--300, 1997.

Cimatti, A., and M. Roveri. “Conformant Planning via Symbolic Model Checking.” Journal Of Artificial Intelligence Research, 1 June 2011, arxiv.org/abs/1106.0252.