

# Research Review

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This review is a brief summary of three important historical developments in the field of AI planning and search noted with my own understanding.

## STRIPS

STRIPS is a new problem-solving program named Stanford Research Institute Problem Solver. It is an early version of the program implemented in LISP. The function of STRIPS is to find one given goal is achieved in a specified space.<sup>1</sup> This language is the base of most of the languages for expressing automated planning problem instance in use today. Mathematically, a STRIPS instance is a quadruple  $\{ P, O, I, G \}$ , in which each component has the following meaning: P: a set of conditions, O: a set of operators, I: the initial state, G: the specification of the goal state. A plan for such a planning instance is a sequence of operators that can be executed from the initial state and that leads to a goal state. Deciding whether any plan exists for a propositional STRIPS instance is PSPACE-complete. Various restrictions can be enforced in order to decide if a plan exists in polynomial time or at least make it an NP-complete problem.<sup>2</sup>

## PDDL

PDDL, which is also called the Planning Domain Definition Language. It is a planning language inspired by STRIPS. Proposed as the problem-specification language for one competition.<sup>3</sup> It separated the model of the planning problem in two major parts: domain description and the related problem description. Such a division of the model allows for an intuitive separation of those element. And the element determines the specific planning-problem.<sup>4</sup> Nowadays, we can see the version of PDDL is still increasing and widely used in domain of artificial intelligence and mathematical. There are also a variety kind of language derive from PDDL. For example, PDDL+, NDDL etc.

## OBDD

OBDD, Ordered Binary decision diagram, or branching program is a data structure that is used to represent a Boolean function. On a more abstract level, BDDs can be considered as a compressed representation of sets or relations.<sup>5</sup> In popular usage, the term BDD almost always refers to Reduced Ordered Binary Decision Diagram. It is a canonical form for Boolean formula, which can often use in different problems solving. This property makes it useful in functional equivalence checking and other operations like functional technology mapping.

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<sup>1</sup> Richard E. Fikes, Nils J. Nilsson, STRIPS: A New Approach to the Application of Theorem Proving to Problem Solving, Stanford Research Institute, Menlo Park, California

<sup>2</sup> <https://en.wikipedia.org/wiki/STRIPS>

<sup>3</sup> Malik Ghallab etc. PDDL—The Planning Domain Definition Language, Ecole Nationale Supérieure D'ingenieur des Constructions Aeronautiques.

<sup>4</sup> [https://en.wikipedia.org/wiki/Planning\\_Domain\\_Definition\\_Language](https://en.wikipedia.org/wiki/Planning_Domain_Definition_Language)

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<sup>5</sup> [https://en.wikipedia.org/wiki/Binary\\_decision\\_diagram](https://en.wikipedia.org/wiki/Binary_decision_diagram)