

## Research Review

### *STRIPS*

STRIPS is the Stanford Research Institute Problem Solver. This was the first major planning system of AI in that it executes actions to find a goal. One describes a world or a problem and provides actions, preconditions, and effects. Once the problem is defined with an initial state and a goal condition, STRIPS will then start from the initial state, search all possible states, reach different states by executing actions continuously until it reaches the goal state. Here, we can define the different types of searches that were used to facilitate searching of the tree. The different searches were breadth first, depth first, and the most intelligent: A\* search.

### *Graphplan Algorithm*

This algorithm by Blum and Furst changed the direction of how artificial intelligence would plan to solve problems. Previous to this algorithm, research was based on non-linear and partial-order planning algorithms. Partial-order planning was intuitive to how we think, but incredibly slow. The Graphplan algorithm instead found plans of fixed lengths and implements information to prune the search tree. By implementing these two strategies, the Graphplan algorithm was incredibly successful in performance speed compared to predecessors. The Graphplan algorithm began the approach of planning as a constraint satisfaction problem. Simply put, Graphplan followed this formula:

- 1) Make a plan graph of depth  $x$
- 2) search for a solution
- 3) If successful, return the plan
- 4) Else  $x += 1$
- 5) Repeat

### *Binary Decision Diagrams*

Binary Decision Diagrams have recently been used to represent plans as data structures for Boolean expressions used in hardware. Binary Decision Diagrams were able to identify redundancies in a search tree and were able to merge equivalent nodes, merge isomorphic nodes, and eliminate redundant tests. These diagrams were then able to prune the search trees and able to be more successful in planning. There are numerous derivations of binary decision diagrams including the Multi-Terminal BDD, Free BDD, Ordered BDD, Reduced Ordered BDD.

## References

- Bryant, Randal E. *Graph-Based Algorithms for Boolean Function Manipulation*.
- Norvig, P. (2013). *Artificial Intelligence: A Modern Approach* (Third ed.). S.I.: Pearson Education Limited.
- Rintanen, J. and Hoffmann, J.. *An Overview of Recent Algorithms for AI Planning*. Künstliche Intelligenz.

