

Branch - And - Bound

Introduction:-

Branch & bound is a technique for exploring an implicit directed graph. It is a acyclic graph or tree which is used for making the choices, called state-space-tree. The optimal solution is found by branch & Bound technique rather than many feasible solution.

feasible solution:-

A feasible solution is a point in problem's search space that satisfies all the problem's constraints.

eg:- greedy method - knapsack problem.

optimal solution:-

A feasible solution with best value of objective function.

eg:- Dynamic programming - principle of optimality.

Compared to bi, bb requires 2 additional items:-

* for every node of a state-space tree, a bound (lower bound or upper bound) on the local value of objective function of any solution.

→ we can compare node's bound value with the value of best solution seen so far.

→ if the b value is not better than best solution seen so far - i.e., not smaller for a min problem & not larger for max problem. - the node is non-promising & can be terminated because no solution obtained from it can yield a better solution than one already available.

Reason for terminating a search path at the current node in state-space tree:-

* The value of node's bound is not better than the value of best solution seen so far.

* The node represents no feasible solution because the constraints of problem are already violated.

* The subset of feasible solution represented by node consists of single point.

eg:-

→ Assignment problem:-

In this, n agents are to be assigned to n tasks, each agent having exactly one task to perform. The problem is to assign agents to tasks so as to minimize the total cost of executing the n -tasks.