Topic 5.2 Finding Optimal Game Strategies using MINIMAX Algorithm

A. Major steps of the algorithm, from opener's point of view:

1) Generate the whole game tree.

2) Find the utility of the terminal nodes.

Example

Even Tic-tac-Toe is large!
We take an imaginary game of just 2 moves (4 half moves or plies) deep, with branching factor 3.

3) Determine the MINIMAX values of the non-terminal nodes, from leaf nodes up to the root.
If a level represents MAX's turn, then the highest values of the successors are taken, and in case of MIN's – lowest values.

4) Choose the best opening move.

B. Important aspects of MINIMAX algorithm:

1) Returns an optimal strategy; Opener always wins if the players have equal opportunity and implement the strategy without mistake.

2) The strategy is a depth-first one; Time cost is impractical for real games.

3) Improvements can be proposed using heuristics and pruning.

4) The algorithm can be extended for more than 2-player games with a vector of utility values for each node reflecting each player's view.

5) In a multiplayer game, alliances / coalitions are made and broken as the game proceeds for cooperation among some against other(s).