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Game Playing in Artificial Intelligence

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Abstract:
This paper focuses on the how Game Playing is an important domain of Artificial intelligence .AI is also used in game playing. Various researchers have extensively contributed for computer game – playing methods. Games don't require much knowledge: the only knowledge we need to provide is the rules, legal moves and the condition of winning or losing Game . Both players try to win the game . so both of them try to make the best possible move at each turn. Shannon's paper on chess-playing and Samuel's checkers are considered as land marks in the area of computer game playing. We also explain in this paper major components of game playing program , static evaluation function generator, game playing strategies: i) minimax strategy ii) minimax strategy with alpha – beta cutoffs.

Keyword: Major components of this paper are: game playing program, static evaluation function generator, game playing strategies) minimax strategy ii) minimax strategy with alpha – beta cutoffs.

Introduction:
Making computer accurately monitor health of physical equipment, infrastructure there can be matrices, images used to predict what kind of maintenance is required? AI can make a major contribution to disaster Management, etc. Many researchers, scientists are working on various fields of AI, which can Help Government for better governance. AI also plays an important role in Game playing. Shannon's paper on chess-playing and Samuel's checkers are considered as land marks in the area of computer game playing. AI is also used in traffic control. As an example , Milton Keynes in UK has recently announced the adoption and development of 'smart traffic lights'. Signals are based on actual traffic going through them. They will monitor through Sensors and cameras.

The above reasons explains how AI plays an important role in better governance. Field of AI plays a pivot role in game playing are:

- The rules of the game are limited.
- Many human experts exist to assist in the developing of the programs.
- For the human expert, it is easy to explain in the rationale for a move unlike other domains.
- Games pasteurize real life situations in a constricted fashion. The logical reasoning ability of the human in a normal condition and under stress is clearly exhibited in game- playing.
- Unfortunately, development of computer game playing programs is not that easier as was visualized. To cite an example, consider the game of chess. The rules of game are simple, limited and concise .but computer chess playing has to face the problem of combinatorial explosion of solutions for the following reasons:
- In an average game, the number of moves made is approximately 50.

- For each move a player makes, the branching factor, on an average is 35.
- Hence the number of positions to be examined is of the order of $35^{100.}$

If one attempts to perform the search using a brute force search method, it will be practically impossible to arrive at a solution. While discussing about heuristics, we made a brief mention about the type of the problem for which algorithms must exist but are computationally infeasible. **Chess –playing** programs belong to this category.

Major components of game-playing program: For every move a player makes in the game of chess, the average branching factor is 35.i.e; the opponent can make 35 different moves. If we are to employ a simple move generator, then it might not be possible to examine all the states .hence it is essential that only very selected moves , that expands or generates only selected moves. It is not possible for all moves to be examined because:

- The amount of the time for a move is limited.
- The amount of computational power available at the disposal for examining various states is also limited. However, further research work is going on to enhance the computational power using parallel processing architectures.

Static evaluation function generator: This is the most important component of the game-playing program. Based on the heuristics, this generates the static evaluation function value for each and every move that is being made. The static evaluation function gives a snapshot of a particular move. More the static evaluation function value more is the probability for a victory. Static evaluation function generator occupies a crucial role in game-playing programs because of following factor:

- It utilizes the heuristic knowledge for evaluating the static evaluation function value.
- The static evaluation function generator acts like a pointer to point the way the plausible move generator has to generate future paths.

Rich [1985] has provided a static evaluation function for chess game.

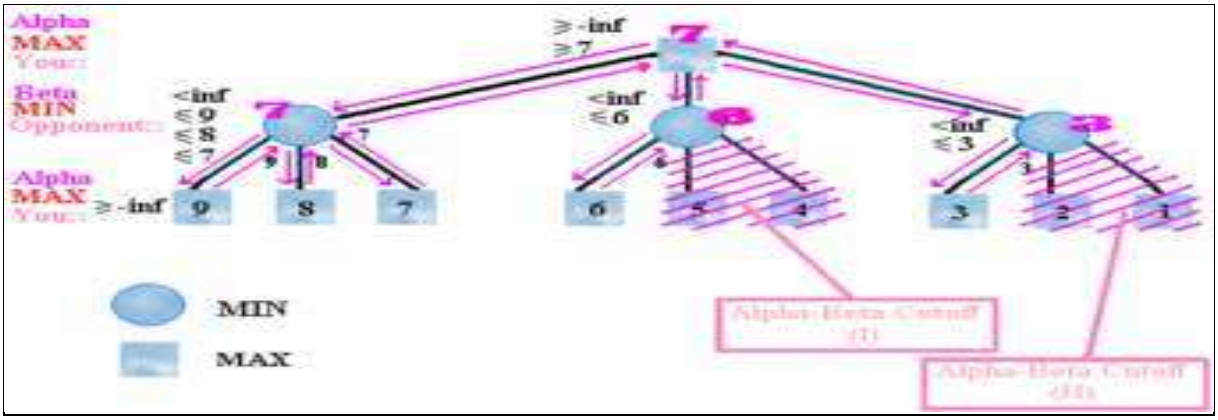
Game playing strategies: Games can be classified as either a single –person playing or multi-person playing. Games like Rubik's cube, 8-tile puzzle, etc. are single person games. For these search strategies such as best first or A^* algorithm can be used. These strategies help in identifying paths in a clear fashion On the other hand, in a two person game chess, checkers etc, each player tries to outsmart the opponent. Each has their own way of evaluating the situation and since each player tries to obtain the maximum benefits, best-first search or A^* algorithms do not serve the purpose.

The basic methods available for game playing are:
Minimax strategy
Minimax strategy with alpha-beta cutoffs.
Minimax strategy: Minimax strategy is a simple look ahead for two- person game-playing. Here one player is maximized and other is minimize. Both of the adversaries maximize and minimizer fights it out to see that the opponent gets the minimum benefit while they get the maximum benefit. The plausible move generator generates the necessary states for the further evaluation and the static evaluation function "ranks" each of the positions. The working of the algorithm is described below with aid of fig:

Let A be the initial state of the game. The plausible move generator generates 3 children for that move and the static evaluation function generator assigns the values given aling with each of the states . it is assumed that static evaluation function generator returns a value from -20 to +20, wherein a value of +20 indicates a win for the maximize and a value of -20 a win for the minimizer. A value 0 indicates a tie or draw.

It is also assumed that the maximize makes the first move .the maximizer, always tries to go to a position where the static evaluation function value is the maximum positive value.

The maximize, being the player to make the first move, will move to node D because the static evaluation function value for that node is maximum. The same figure shows that if the minimizer has to make the first move, he will go to node B because the static evaluation function value at that node is advantageous to him. But a game playing strategy never stops with one level but looks ahead, i.e.; moves a couples of levels downwards to choose the optimal path. Some times by expanding these nodes.

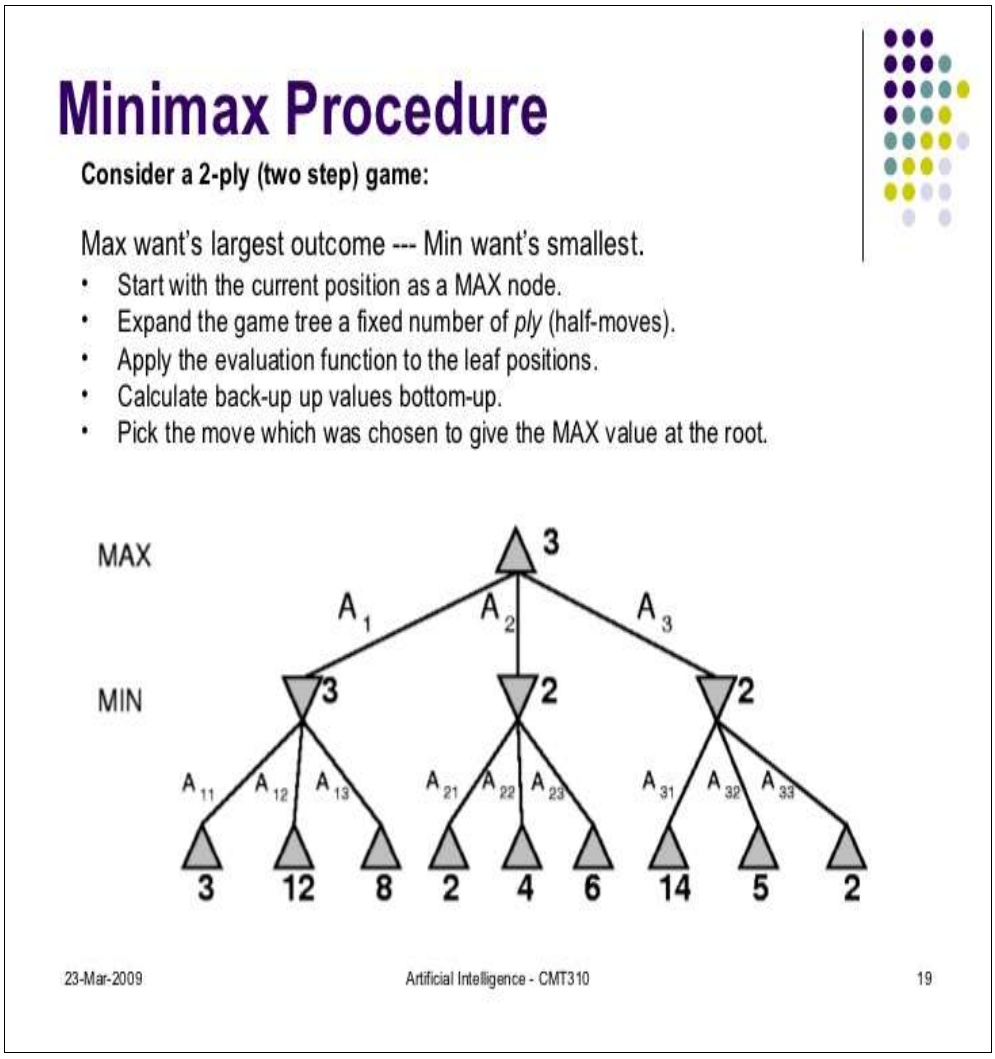


Let us examine this with the help of another figure . let us assume that it is the maximize again who will play first followed by the minimizer . the search strategy here tries for only two moves, the root being A the leaf nodes being A11,A12,A13,A21,A22,A23,A31,A32,A33 Before the maximize moves to A1,OA2or A3 he will have to think which move be highly beneficial to him. In order to evaluate, the children of the intermediate nodes A1,A2 and A3 are generated and static evaluation function value generator has assigned values for all the leaf nodes. If A1 ,A2moves to A3 , it is the minimizer who will have to play next . the minimizer always tries to give the minimum benefit to the other and hence he will move to A11. this is backed up at A1.

Recent invention: Game playing an important role in “artificial intelligence” In “artificial intelligence new invention is chinese game “Go”. Also AI is used in many fields like fighter planes, personal human life, .

Conclusion:

At the end in this paper conclude that game playing is an interesting part of artificial intelligence. The rules of the game are limited. Many human experts exist to assist in the developing of the programs. For the human expert, it is easy to explain in the rationale for a move unlike other domains.



Games picturize real life situations in a constricted fashion. The logical reasoning ability of the human in a normal condition and under stress is clearly exhibited in game- playing.

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