K.G.C.E.
Karjat - Raigad

MinMax Algorithm

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Name:- Shweta. G. Bhoir

Class:- BE/IT

Roll No:- 09

Sub:- IS LAB

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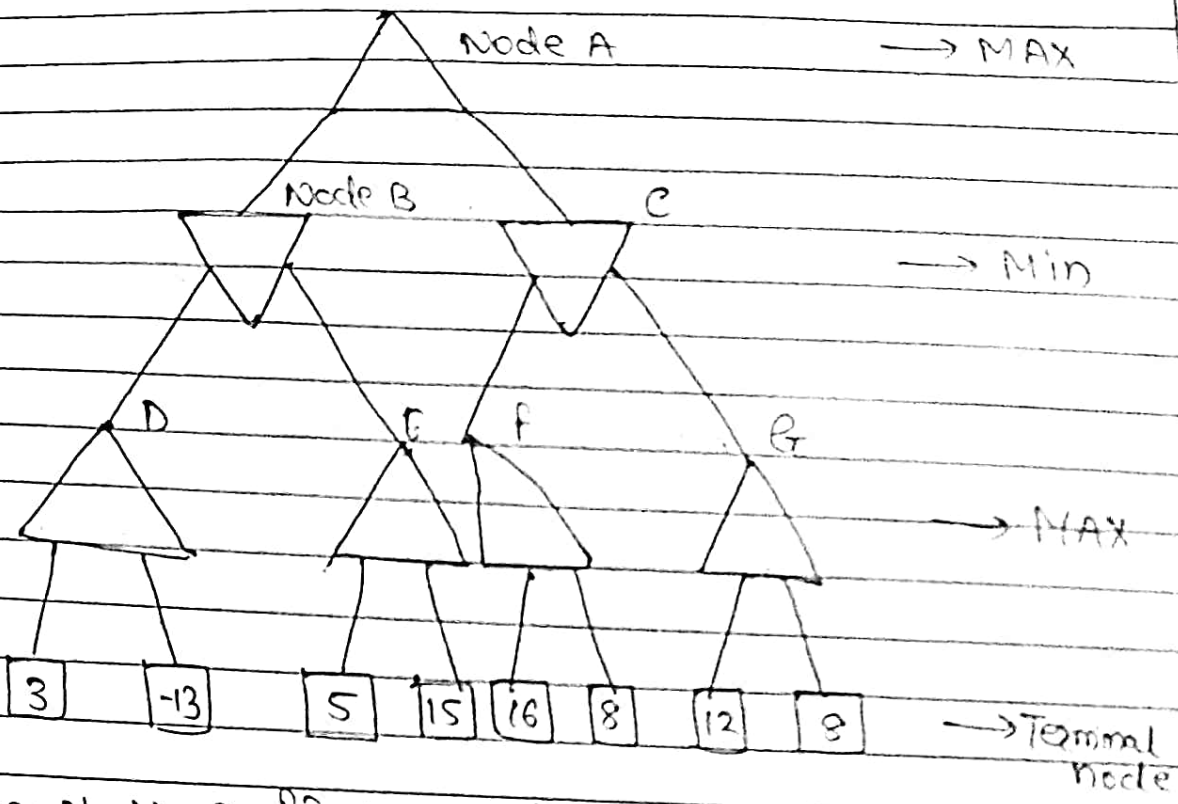
Min-Max Algorithm:-

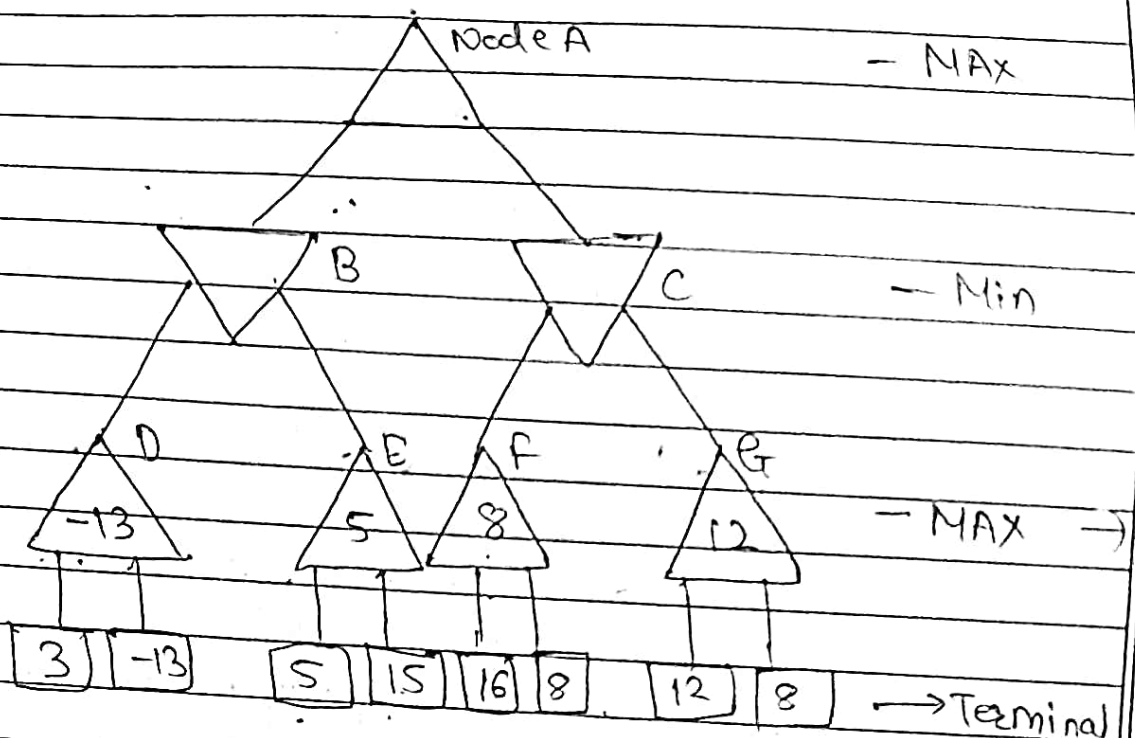
- Min-Max algorithm is a recursive or backtracking algorithm which is used in decision-making and game theory. It provides an optimal move for the player assuming that opponent is also playing optimally.
- Min-Max algorithm uses recursion to search through the game-tree.
- In this algorithm two players play the game, one is call MAX and other is called MIN.
- Min-MAX algorithm is mostly used for game playing in AI. Such as Chess, Checkers, tic-tac-toe. This Algorithm computes the minimax decision for the current state.

Step1:- In the first step, the algorithm generates the entire game-tree and apply the utility function to get the utility values for the terminal states. In the below tree algorithm, let's take A is the initial state of the tree. Suppose maximizer takes first turn which has worst-case initial value = -infinity and minimizer will take next turn which has worst-case initial value = +infinity.



Step 2:- Now first we find the utilities value for the maximize, its initial value is $-\infty$, so we will compare each value in terminal state with initial value of maximizes and determines the higher nodes values. It will find the Maximum among the all.

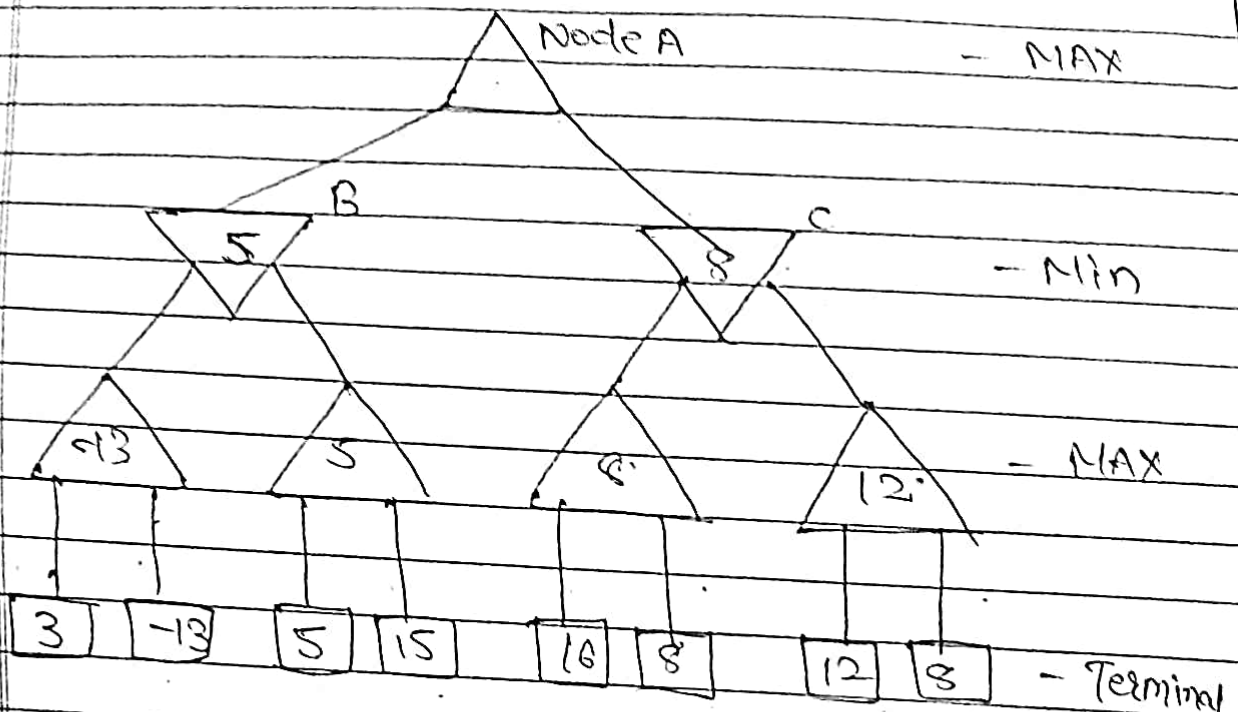
- for node D $\max(3, -\infty) \Rightarrow \max(3, -13) = 13$
- for node E $\max(5, -\infty) \Rightarrow \max(5, 15) = 5$
- for node F $\max(16, -\infty) \Rightarrow \max(16, 8) = 8$
- for node G $\max(12, -\infty) \Rightarrow \max(12, 8) = 12$



Step 3:- In the next step its a turn for minimizer so it will compare all nodes value with $+\infty$ and will find the 3rd layer node values.

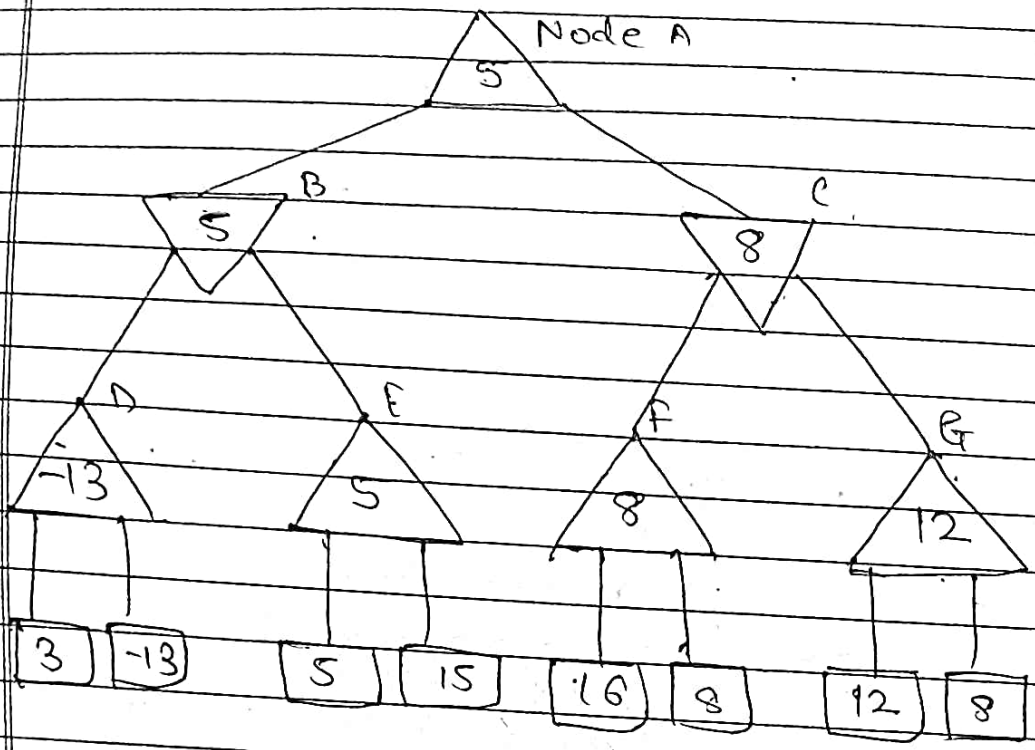
- For node B = min (-13, 5) = 5

- for node C = min (8, 12) = 8



Step 4:- Now its a turn for maximizer and it will again chose the maximum value for the root node. In this game tree, there are only 4 layers, hence we reach immediately to the root node but in real game, there will be more than 4 layers.

- For node A $\max(5, 8) = 5$



That was the complete workflow of the minimax algorithm with two player game