AI Assignment - 5
Minimax and Alpha Beta Pruning

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Code :

```
tree =
{1:(2,3,4),2:(5,6,7),3:(8,9),4:(10,11),5:(12,13),6:(14,15),8:(16,17,18),10:(19,20,21),11:(22,23),14:
(24,25),16:(26,27),18:(28,29),21:(30,31,32)}
values = [0,-1,-1,-1,-1,-1,-1,16,-1,12,-1,-1,4,13,-1,11,-1,9,-1,10,8,-1,7,4,5,10,1,8,6,12,2,5,7]

def minimax(position,depth,maximizingPlayer):

    if depth == 0 or position not in tree:
            return values[position]

    if maximizingPlayer:
            maxEval = -999
            for child in tree[position]:
                    val = minimax(child,depth-1,False)
                    maxEval = max(maxEval,val)
            values[position] =  maxEval
            return maxEval


    else:
            minEval = 999
            for child in tree[position]:
                    val = minimax(child,depth-1,True)
                    minEval = min(minEval,val)
            values[position] = minEval
            return minEval

def alphabeta(position, depth, alpha, beta, maximizingPlayer):
    if depth == 0 or position not in tree:
            return values[position]
```

```
    if maximizingPlayer:
        maxEval = -999
        for child in tree[position]:
            val = alphabeta(child, depth - 1, alpha, beta, False)
            maxEval = max(maxEval, val)
            alpha = max(alpha, val)
            if beta <= alpha:
                break
        values[position] = maxEval
        return maxEval

    else:
        minEval = +999
        for child in tree[position]:
            val = alphabeta(child, depth - 1, alpha, beta, True)
            minEval = min(minEval, val)
            beta = min(beta, val)
            if beta <= alpha:
                break
        values[position] = minEval
        return minEval

print("Minimax : ")
print("Top node value : ",(minimax(1,4,True)))
print(values)
print("------------------------------------\n")
values = [0,-1,-1,-1,-1,-1,-1,16,-1,12,-1,-1,4,13,-1,11,-1,9,-1,10,8,-1,7,4,5,10,1,8,6,12,2,5,7]
print("Alpha-Beta : ")
print("Top node value : ",(alphabeta(1,4,-999,999,True)))
print(values)
```

Output :

```
root@jtl-16:~/Desktop/Artificial Intelligence/EX-5 Minimax# python3 sabari_minimax.py
Minimax :
Top node value :  11
[0, 11, 11, 9, 7, 13, 11, 16, 9, 12, 10, 7, 4, 13, 5, 11, 1, 9, 6, 10, 8, 2, 7, 4, 5,
10, 1, 8, 6, 12, 2, 5, 7]
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Alpha-Beta :
Top node value :  11
[0, 11, 11, 9, 10, 13, 11, 16, 9, 12, 10, -1, 4, 13, 5, 11, 1, 9, 6, 10, 8, 2, 7, 4, 5
, 10, 1, 8, 6, 12, 2, 5, 7]
root@jtl-16:~/Desktop/Artificial Intelligence/EX-5 Minimax#
```