

**Vivekanand Education Society's Institute of Technology**  
**Department of Computer Engineering**



**Subject: AI**

**Class :- CMPN**

**Semester:-6**

**Div :- D12A**

Roll No: 08	Name: Varnit Batheja		
Exp No: 08	Title: To implement an adversarial searching algorithm.		
DOP:	24-03-2022	DOS:	31-03-2022
GRADE:		LAB OUTCOMES:	SIGNATURE:

## AI EXPERIMENT NO: 8

**AIM :**

Implement an adversarial searching algorithm.

**THEORY :**

**Terminology**

**Game Tree:**

It is a structure in the form of a tree consisting of all possible moves which allow you to move from state of game to next state.

A game can be defined as a search problem with following components

**Initial state :**

It comprises the position of the board and showing whose move it is.

**Successor function:**

It defines what the legal moves a player can make are.

**Terminal state**

It is the position of board when the game gets over.

**Utility function**

It is a function which assigns a numeric value for the outcome of a game. For instance in chess or

Teacher's Sign. \_\_\_\_\_

Tic-tac-toe the outcome is either a win a loss or a draw and these can be represented by values +1 -1 or 0 respectively. There are games that have a much larger range of possible outcomes for instance the utilities in backgammon varies from +192 to -192. A utility function can also be called play of function.

Alpha:

Alpha is the best choice or the highest value that we have found at any instance along the path of maximizer the initial value of alpha is  $-\infty$

Beta:

Beta is the best choice or the lowest value that we have found at any instance along path of minimizer. The initial value for beta is  $+\infty$

Condition for alpha Beta pruning is  $\alpha \geq \beta$

Each node has to keep track of its alpha and Beta values Alpha can be updated only when it's max's turn and similarly beta can be updated when it's min's chance

- Max will update only alpha values and Min player will update only beta values
- Node values will be passed to upper nodes instead of values of alpha and beta during go into reverse of tree.

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- Alpha and Beta values only are passed to child nodes

### Advantages :

- 1) Allows elimination of the search tree branches
- 2) Limited the search time to more promising sub trees which enables a deeper search
- 3) Reduces computation and searching during the minmax algorithm
- 4) Prevents the use of additional computational time making the process more responsive and fast

### Disadvantage

- 1) It does not solve all the problem associated with original minimax algorithm
- 2) Requires a set depth limit as in most cases it is not feasible to search the entire game tree.
- 3) Though designed to calculate the good move it also calculates the value of all the legal moves

### CONCLUSION

In this experiment we have successfully implemented an adversarial searching algorithm alpha beta pruning

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## EXPERIMENT-08

Code:

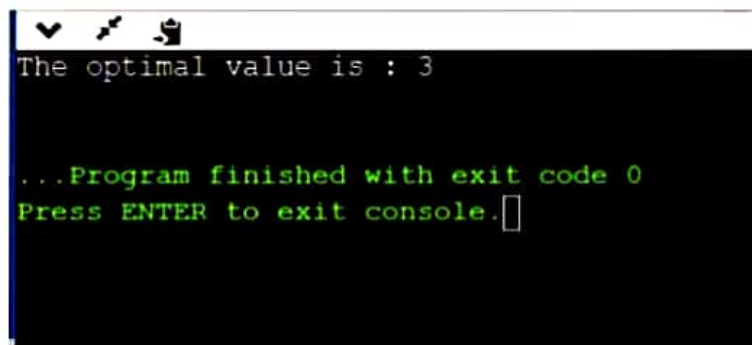
```
MAX, MIN = 1000, -1000

def minimax(depth, nodeIndex, maximizingPlayer, values):
    if depth == 2:
        return values[nodeIndex]

    if maximizingPlayer:
        best = MIN
        for i in range(0, 2):
            val = minimax(depth + 1, nodeIndex * 2 + i, False, values)
            best = max(best, val)
        return best
    else:
        best = MAX
        for i in range(0, 2):
            val = minimax(depth + 1, nodeIndex * 2 + i, True, values)
            best = min(best, val)
        return best

if __name__ == "__main__":
    values = [3,5,10,2,8,19,2,7,3]
    print("The optimal value is :", minimax(0, 0, True, values))
```

Output:



The screenshot shows a terminal window with a dark background. At the top, there are three small icons: a downward arrow, a magnifying glass, and a document icon. The main text in the terminal is white and green. It starts with "The optimal value is : 3" in white. Below that, in green, it says "...Program finished with exit code 0" and "Press ENTER to exit console." followed by a cursor icon.

```
▼ 🔍 📄
The optimal value is : 3

...Program finished with exit code 0
Press ENTER to exit console.█
```