Experiment - 3

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TE Comps
Batch - C

Aim:
To build a Tic-Tac-Toe using A* Algorithm.

Code:

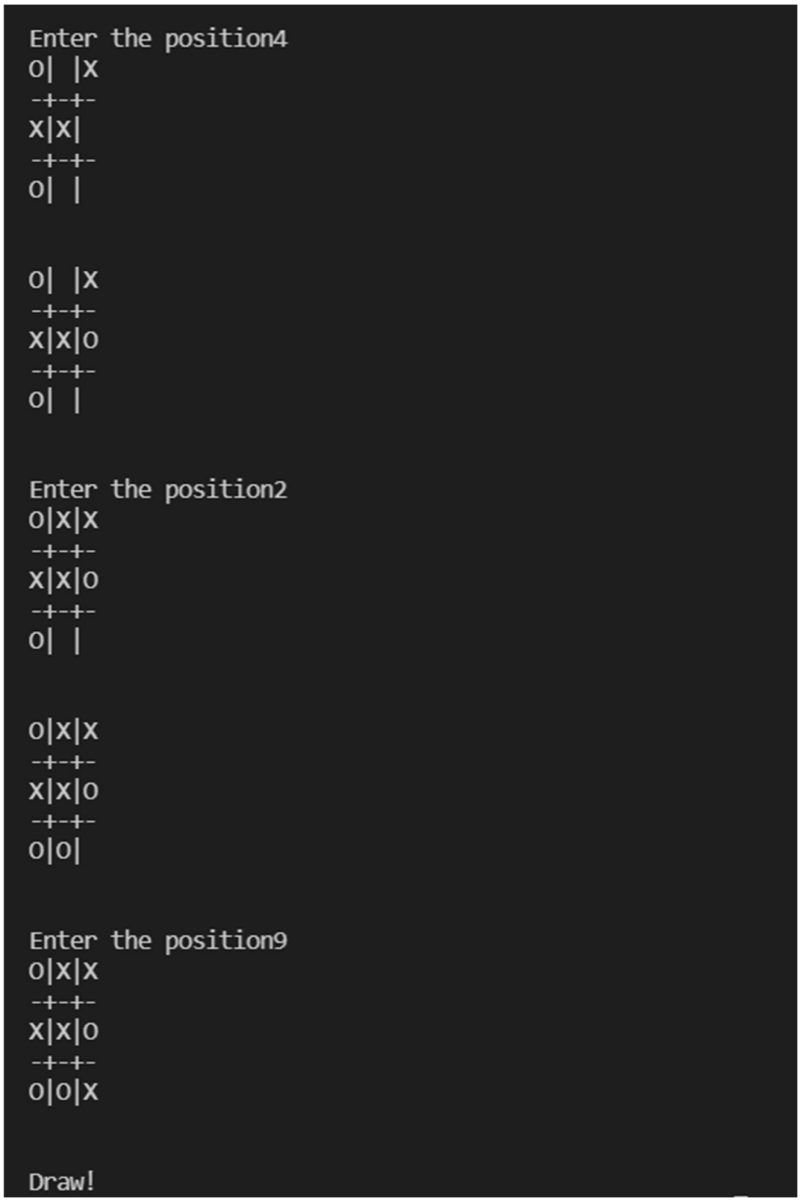
```
game = {1: ' ', 2: ' ', 3: ' ',
        4: ' ', 5: ' ', 6: ' ',
        7: ' ', 8: ' ', 9: ' '}

def insert(letter, position):
    if is_free(position):
        game[position] = letter
        Display(game)
        if (is_draw()):
            print("Draw!")
            exit()
        if Win():
            if letter == comp:
                print("comp wins!")
                exit()
            else:
                print("Player wins!")
                exit()
        return
    else:
        print("Can't insert")
        position = int(input("enter position:  "))
        insert(letter, position)
        return

def is_free(position):
    if game[position] == ' ':
        return True
    else:
        return False
def Display(game):
    print(game[1] + '|' + game[2] + '|' + game[3])
    print('-+-+-')
    print(game[4] + '|' + game[5] + '|' + game[6])
    print('-+-+-')
    print(game[7] + '|' + game[8] + '|' + game[9])
    print("\n")
```

```
def is_winner(mark):
    pos = False
    for j in range(1,8,3):
        check=True
        for i in range(j,j+2):
            if game[i]!=mark or game[i]!=game[i+1]:
                check=False
                break
        pos = pos|check
    for j in range(1,4):
        check=True
        for i in range(j,j+5,3):
            if game[i]!=mark or game[i]!=game[i+3]:
                check=False
                break
        pos = pos|check
    if(game[1] == mark and game[1]==game[5] and game[5]==game[9]):
        return True
    if game[3]==mark and game[3] == game[5] and game[5]==game[7]:
        return True
    return pos

def is_draw():
    for key in game.keys():
        if (game[key] == ' '):
            return False
    return True
def player_turn():
    position = int(input("Enter the position"))
    insert(player, position)
    return
def Win():
    return is_winner(comp)|is_winner(player)
def computer():
    Move = 0
    MaxScore = -1000
    for key in game.keys():
        if (game[key] == ' '):
            game[key] = comp
            score = find_score(game, 0, False)
            game[key] = ' '
            if (score > MaxScore):
                MaxScore = score
                Move = key

    insert(comp, Move)
    return
```

```
def find_score(game, h, is_bot):
    if (is_winner(comp)):
        return 1000
    elif (is_winner(player)):
        return -1000
    elif (is_draw()):
        return 0
    if (is_bot):
        bestScore = -1000
        for key in game.keys():
            if (game[key] == ' '):
                game[key] = comp
                score = find_score(game, h + 1, False)
                game[key] = ' '
                if (score > bestScore):
                    bestScore = score
        return bestScore

    else:
        bestScore = 1000
        for key in game.keys():
            if (game[key] == ' '):
                game[key] = player
                score = find_score(game, h + 1, True)
                game[key] = ' '
                if (score < bestScore):
                    bestScore = score
        return bestScore

def show_layout():
    print("This is the grid layout")
    print("1, 2, 3 ")
    print("4, 5, 6 ")
    print("7, 8, 9 ")
    print("\n")

if __name__=="__main__":
    Display(game)
    show_layout()
    print("Your turn")
    player = 'X'
    comp = 'O'
    while not Win():
        player_turn()
        computer()
```

Output:

```
PS C:\Users\Samkit\Desktop\College\sem5\AIML\Lab 3> python tictactoe.py
 | |
-+-+-
 | |
-+-+-
 | |


This is the grid layout
1, 2, 3
4, 5, 6
7, 8, 9


Your turn
Enter the position5
 | |
-+-+-
 |X|
-+-+-
 | |


O| |
-+-+-
 |X|
-+-+-
 | |


Enter the position3
O| |X
-+-+-
 |X|
-+-+-
 | |


O| |X
-+-+-
 |X|
-+-+-
O| |
```



Conclusion:
This project served as a foundation for learning how artificial intelligence may be applied in games, opening the way for more complex AI games. In this experiment, I employed the heuristic in terms of the maximum score that can be attained while taking into account both the user's and the computer's interests, and I chose the cell with the highest heuristic value. To summarise, for each decision in that round, I evaluated the difference between the winning combinations of bot and user, then estimated which choice would lead to computer victory and which would not. If there are several movements that are similar, the component is placed at random.