**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'

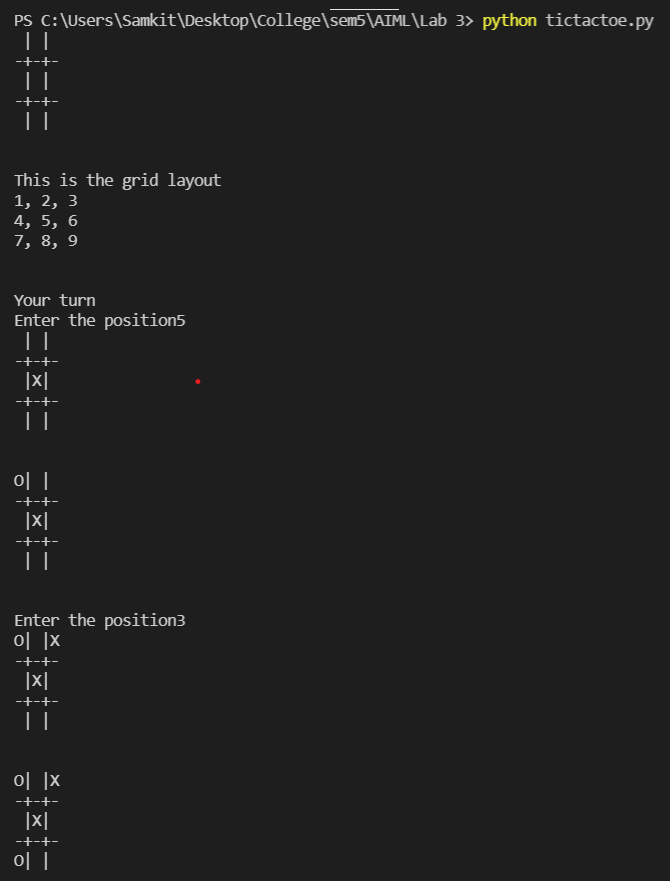
    comp = 'O'

    while not Win():

        player\_turn()

        computer()

**Output**:



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.