Project Report

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1. We Plotted C3 floor by Rectangle Function

2. Then we Plotted the Access Points by Plot Function and respresented each Access Point by a Circle

3. Created 2 arrays one for the X coordinates of all the Access Points and one for Y coordinates of Access Points

4. Created 2 arrays one for all X coordinates of each wall and other for Y coordiantes of each wall and each wall coodinate is separeted by a (;)

5. Created a 5D array that holds total power received from each Access Point for each point in the grid

6. Created 2D array that holds the tota points in the grid

7. Then we created a Loop on all the points in the grid and computes the power received from each access point and put it in (Total_Power_Temp) then we add the 5 received powers in a separete row in (Total_Power array) and add the point to (Mapped_Points) array so the point and it's received power are with the same index

8. Then we implemented a Finding_Location Function that returns the location of the Point by finding the index where the distance between the input powers and the received power in the (Total_Power) array is mininum

9. Finally we plotted a contour map for all the access points together and a contour map for each access point

Main Code :

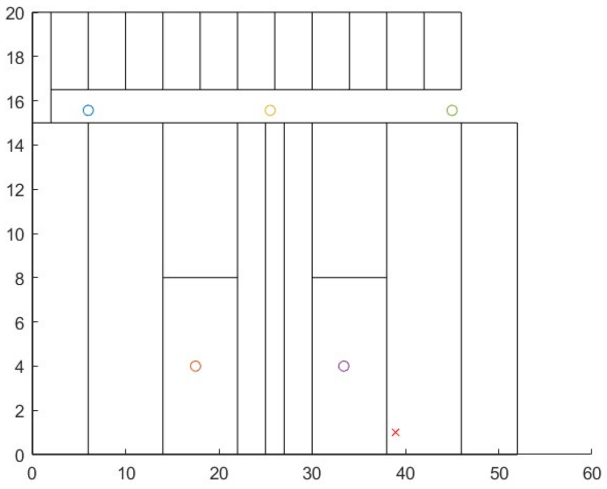
```
clc
close all
close all

% Drawing the Walls
rectangle('Position',[0,0,6,15]);
rectangle('Position',[6,0,8,15]);
rectangle('Position',[14,0,8,8]);
rectangle('Position',[14,8,8,7]);
rectangle('Position',[22,0,3,15]);
rectangle('Position',[25,0,2,15]);
rectangle('Position',[27,0,3,15]);
rectangle('Position',[30,0,8,8]);
rectangle('Position',[30,8,8,7]);
rectangle('Position',[38,0,8,15]);
rectangle('Position',[46,0,6,15]);
rectangle('Position',[0,15,2,5]);
rectangle('Position',[2,16.5,4,3.5]);
rectangle('Position',[6,16.5,4,3.5]);
rectangle('Position',[10,16.5,4,3.5]);
rectangle('Position',[14,16.5,4,3.5]);
rectangle('Position',[18,16.5,4,3.5]);
rectangle('Position',[22,16.5,4,3.5]);
rectangle('Position',[26,16.5,4,3.5]);
rectangle('Position',[30,16.5,4,3.5]);
rectangle('Position',[34,16.5,4,3.5]);
rectangle('Position',[38,16.5,4,3.5]);
rectangle('Position',[42,16.5,4,3.5]);

%Drawing the APs
hold on
plot(6,15.5635,'o')
plot(17.5,4,'o')
plot(25.5,15.5635,'o')
plot(33.4,4,'o')
plot(45,15.5625,'o')


% Getting the Xs and the Ys of the APIs
x_APs = [6,17.5,25.5,33.5,45];
y_APs = [15.5625,4,15.5625,4,15.5625];

%Getting the X & Y values of all walls
x_walls = [0 52;6 6;14 14;14 22;22 22;25 25;27 27;30 30;30 38;38 38;46 46;2 2;2 46;6
6;10 10;14 14;18 18;22 22;26 26;30 30;34 34;38 38;42 42;46 46];
y_walls = [15 15;0 15;0 15;15 15;0 15;0 15;0 15;0 15;15 15;0 15;0 15;15 20;16.5
16.5;16.5 20;16.5 20;16.5 20;16.5 20;16.5 20;16.5 20;16.5 20;16.5 20;16.5
20;16.5 20];

%Received power Array (each row represent a received power from 5 APs)
Total_Power = [];

%Mapped points to received power array (each row represent a point)
Mapped_points = [];



%Loading the arrays
for x1 = 1:1:52
    for y1 = 1:1:20

        Total_Power_Temp = [];
        for i = 1:1:5
            x_AP = x_APs(i);
            y_AP = y_APs(i);
            Distance = sqrt( (x1- x_APs(i))^2 + (y1-y_APs(i))^2 );
            P_Loss = ( (4*pi*Distance)/0.125 )^3;
            P_Loss_DB = 10*log10(P_Loss);
            x_abs = [x1 x_AP];
            y_abs = [y1 y_AP];
            counter = 0;

            for w = 1:1:24
                x_wall = x_walls(w,:);
                y_wall = y_walls(w,:);
                [x_int,y_int] = curveintersect(x_wall,y_wall,x_abs,y_abs);
                if  isempty(x_int) == 0 && isempty(y_int) == 0
                    counter = counter + 1;
                end
            end
            Pr = -10 - P_Loss_DB - (3*counter);
            Total_Power_Temp(end+1) = Pr ;
        end
        Total_Power = [Total_Power;Total_Power_Temp];
        Mapped_points = [Mapped_points;x1 y1];

    end
end

[x,y] = Finding_Location(-141,-122,-121,-99,-112,Total_Power,Mapped_points);
x
y
plot(x,y,'x','Color','Red')

%Contour Maps for each AP
for i=1:1:5
        D = [Mapped_points(:,1),Mapped_points(:,2),Total_Power(:,i)];
        [Du,D1] = unique(D(:,1));
        Dd = diff(D1);
        Dr = reshape(D, Dd(1), [], size(D,2))
        X = Dr(:,:,1);
        Y = Dr(:,:,2);
        Z = Dr(:,:,3);
        figure
        contourf(X, Y, Z)
end

%Contour Map for all the AP
 Dtot = [Mapped_points(:,1),Mapped_points(:,2),max(Total_Power.').'];
        [Du,D1] = unique(Dtot(:,1));
        Dd = diff(D1);
        Dr = reshape(Dtot, Dd(1), [], size(Dtot,2));
        X = Dr(:,:,1);
        Y = Dr(:,:,2);
        Z = Dr(:,:,3);
        figure
        contourf(X, Y, Z)
```

Finding_Location Code :

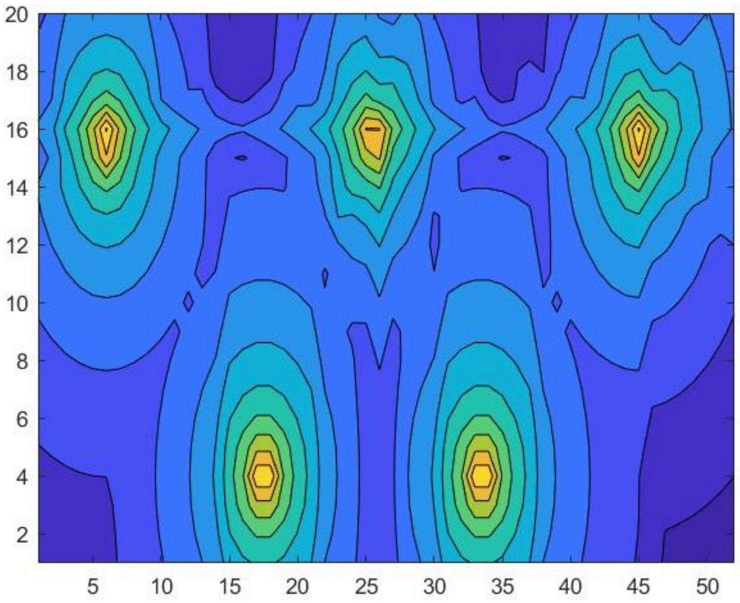
```
function [x,y] = Finding_Location(R1,R2,R3,R4,R5,Total_Power,Mapped_points)

Total_Received = [];

for i = 1:1:1040
    Total_Power_Temp = Total_Power(i,:);
    Received_Temp =(R1-Total_Power_Temp(1))^2 + (R2-Total_Power_Temp(2))^2 + (R3-
Total_Power_Temp(3))^2 + (R4-Total_Power_Temp(4))^2 + (R5-Total_Power_Temp(5))^2;
```

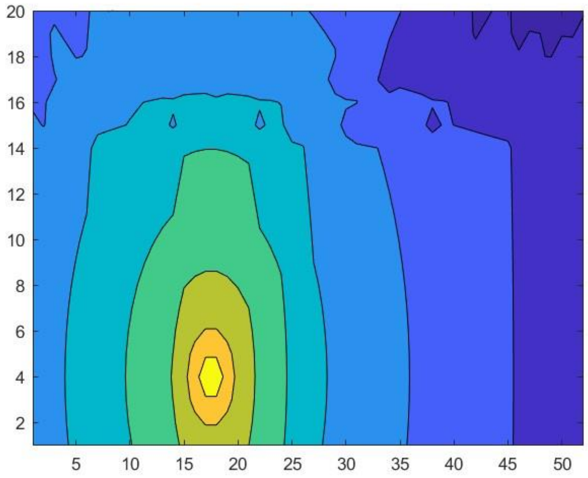
```
    Total_Received(end+1) = Received_Temp;
end

Min_Power_index = find(Total_Received == min(Total_Received));

x = Mapped_points(Min_Power_index,1);
y = Mapped_points(Min_Power_index,2);

end
```

Location of Point



Contour Maps

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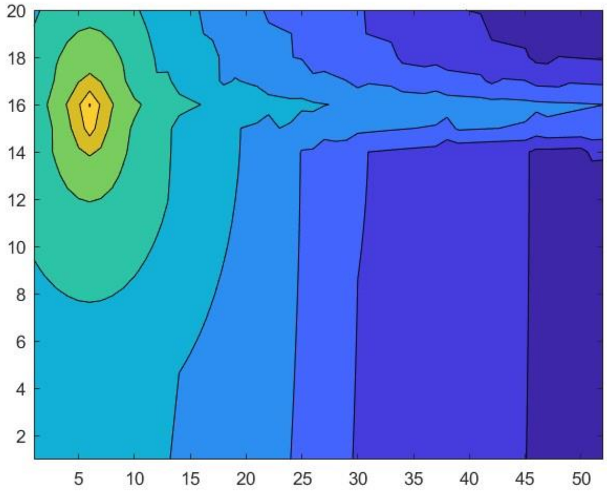
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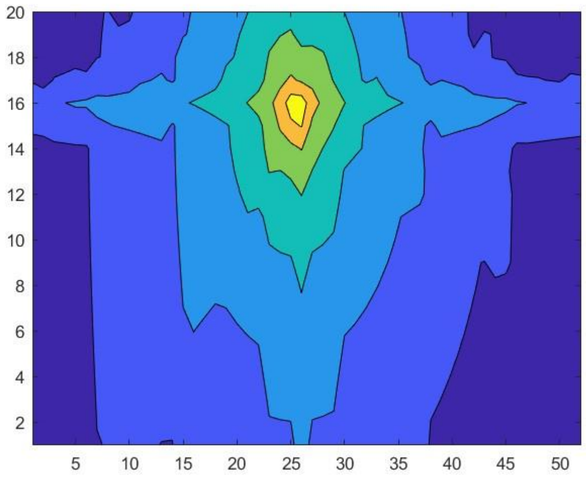
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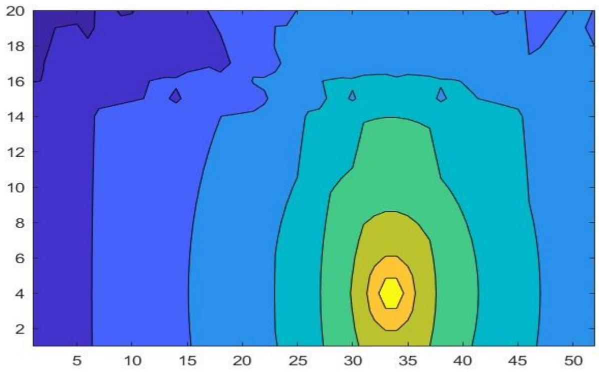
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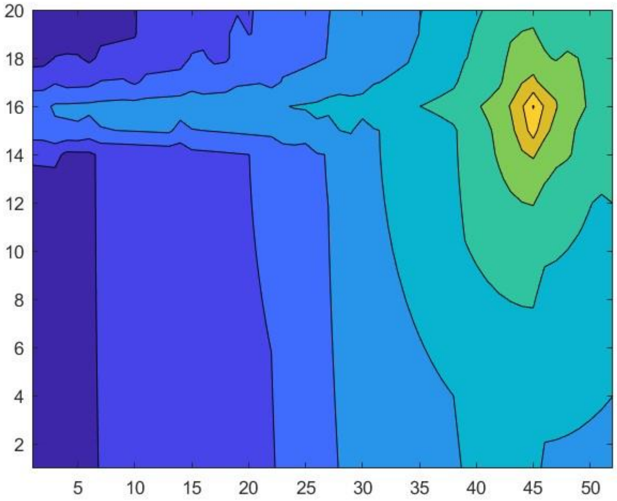
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