Date:2021-12-8

Since the distance from CUE k to D2D link i was not given in the parameter table, i decide to use the distance from CUE k to the mid point of D2D link i as a desired distance as shown in the figure below

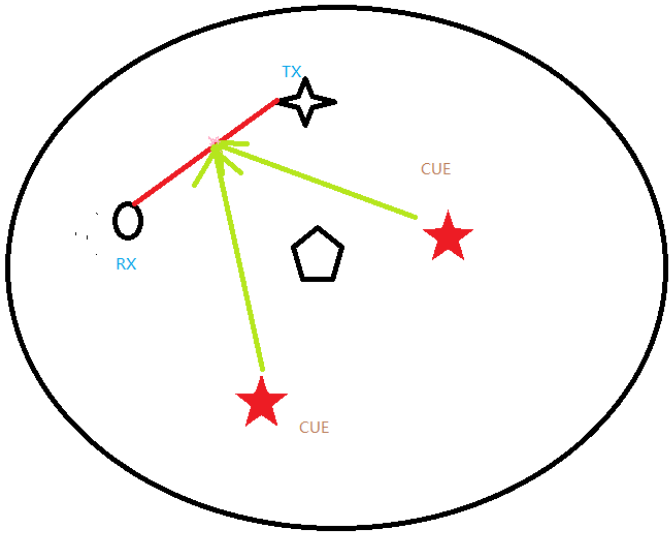


Figure 1:System modeling

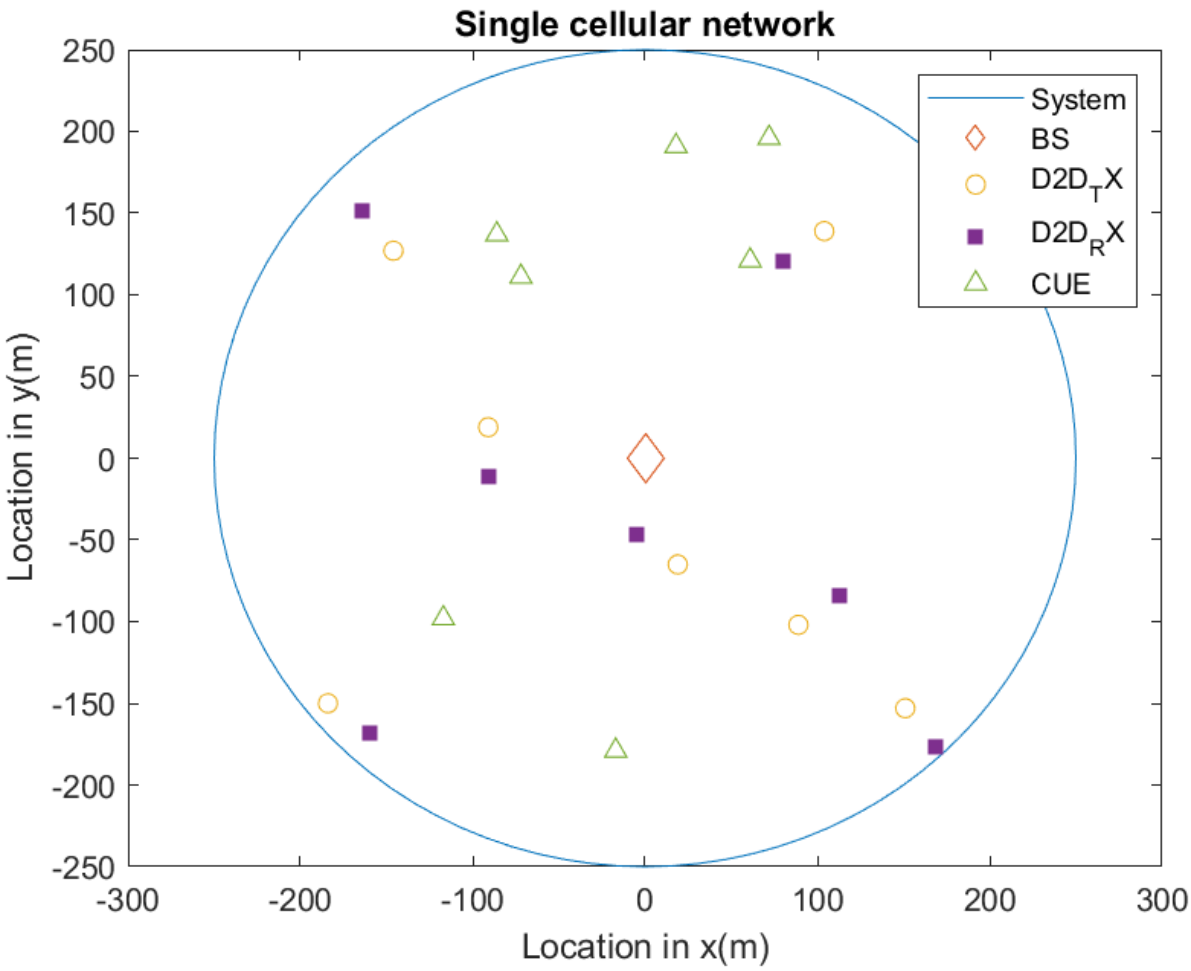
So, let's say we have n TXs, then there will be n RXs which can linked to it, for example if i have 7 TXs in the cellular network, then there will be 7 RXs, so the number of D2D links will be 7. So, my idea is trying to assign all of the TX and RX points different coordinates to make sure that they randomly distributed, then link them the RX and TX together.

So when assigning different coordinates to different TXs and RXs, there will the distance for D2D link i will also calculated using a for loop, and for each CUE k, calculate the distance from k to m. Remember that want the distance from D2D_TX to D2D_RX to be a specific value. So i use the following function

```
function [RX_x,RX_y]=RX(x,y,distance)
a=(150)*rand(1)-30;
b=300*rand(1)-150;
dist=hypot(x-a,y-b);
while dist~=distance
    a=randperm(150,1)-30;
    b=randperm(300,1)-150;
    dist=hypot(x-a,y-b);
end
RX_x=a;
RX_y=b;
end
```

For example, if my randomly generated point for D2D_TX's coordinate is [30,30], then the randomly generated number will be generated accordingly.

In the figure below, it shows the situation where the the distance between D2D RX and D2D TX is 30m



And for each link, the distance from any CUE k to it will also be calculated

```
function dis=dki(link,CUE)
midpoint=1/2*(link(1,:)+link(2,:));
dis=pdist([midpoint(1) midpoint(2); CUE(1) CUE(2)]);
end
```

The corresponding code is:

```
number=randperm(400,30)-200;
number1=number(1:7)
number1=number1';
number2=number(8:14);
number2=number2';
number3=number(16:22);
number3=number3';
Choice=randperm(400,80)-200;
CUE=Choice(41:47);
CUE=CUE';
D2D_TX=Choice(11:17);
D2D_TX=D2D_TX';
D2D_TX_coord=[];
D2D_TX_coord(:,1)=number1;
D2D_TX_coord(:,2)=D2D_TX;
D2D_TX_coord
CUE_coord=[];
```

```
CUE_coord(:,1)=number3;
CUE_coord(:,2)=CUE;
distance=[];
for i=1:size(D2D_TX_coord,1)
    temp=D2D_TX_coord(i,:);
    x=temp(1);
    y=temp(2);
    [a,b]=RX(x,y,30);
    RX_coord(i,:)=[a b];
    distance(end+1)=pdist([a b; x y]);
end
th = 0:pi/50:2*pi;
x=0;
y=0;
r=250;
xunit = r * cos(th) + x;
yunit = r * sin(th) + y;
BS=0;
plot(xunit,yunit)
hold on
scatter([0],BS,140,'d');
hold on
scatter(D2D_TX_coord(:,1)',D2D_TX_coord(:,2)');
hold on
scatter(RX_coord(:,1)',RX_coord(:,2)','filled','s');
hold on
scatter(number3,CUE,'^');
hold off
legend('System','BS','D2D_TX','D2D_RX','CUE');
title('Single cellular network')
xlabel('Location in x(m)')
ylabel('Location in y(m)')
```