Homework 4 submission

ECET 512 — Wireless Systems

Siddhesh Deodhar
ID: 14528073

May 5, 2022

1 Submitted files

For this assignment, besides this report, the following archives were created:

1.1 SRC Folder

+ *"sectors.m"*: Running this function simulates multiple user scenario in sectorised cell. This function calls other subroutines and finally gives the output of moving user video and arrays which indicate number of users in a specific cell at a particular frame.
+ *"drawCluster.m"*: This function draws clusters
+ *"drawSectors.m"*: This function draws sectors within each cell
+ *"ServingCell2.m"*: This function computes the serving cell and connects the user with sector antennas.
+ *"radiationplot.m"*: This function plots the radiation pattern of horn antenna.
+ *"sphere3d.m"*: This function is the given function for plotting 3D graphs

1.2 DOC Folder

+ *"multi-users.avi"*: This video shows multiple users moving across sectorised cells.
+ *"radiation1.jpg"*: This represents the graph of the radiation pattern
+ *"radiation2.jpg"*: This represents the graph of the radiation pattern
+ *"radiation3.jpg"*: This represents the graph of the radiation pattern
+ *"sectors.jpg"*: This represents the graph of the sectors

2 Code explanation page 1

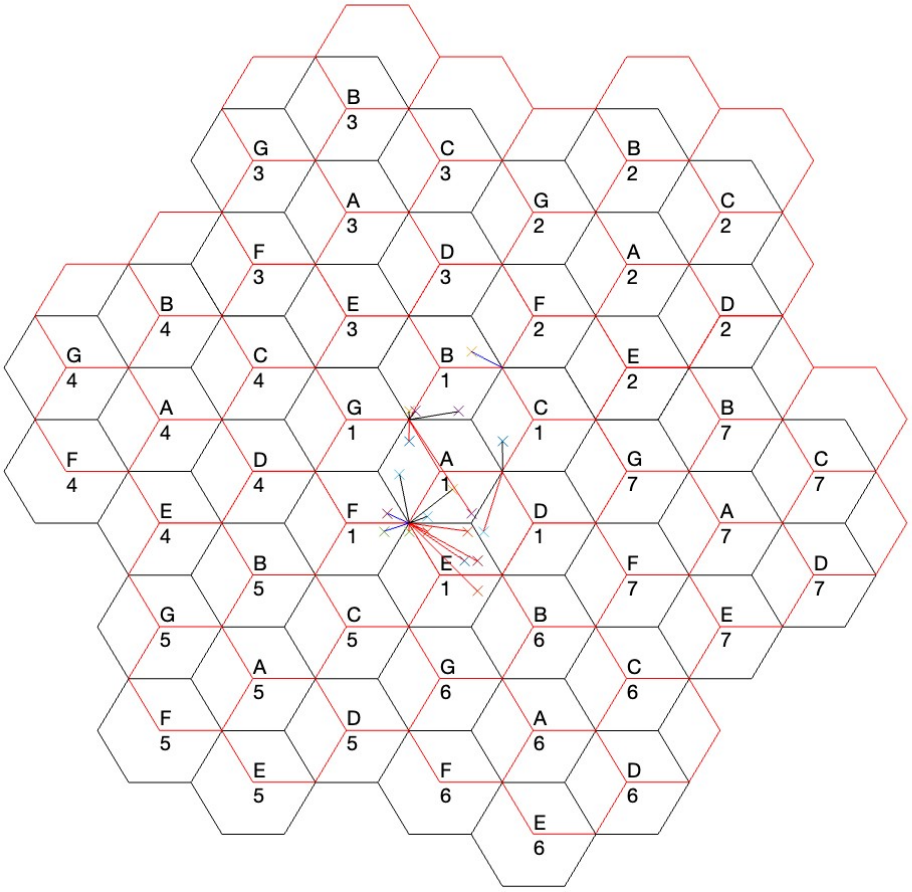
multiusers.m :

```
% Random user trajectory
mobilePos = linspace( -100+50j, 100+50j, numFrames );


% Array for storing real time distances from base station
B=[];


 % Draw 7 clusters with cluster size N drawCluster( 100, N );
  plot (mobilePos(index),'x')         // plot user's active position



% Compute the serving cell
 [B]= ServingCell2(mobilePos(index),B,N,index,1);

% for loop for iterating over all frames to get number of users per cell
for index2 = 1 :numFrames
count=0;  % count for number of users in a cell
```

3 Code explanation page 2

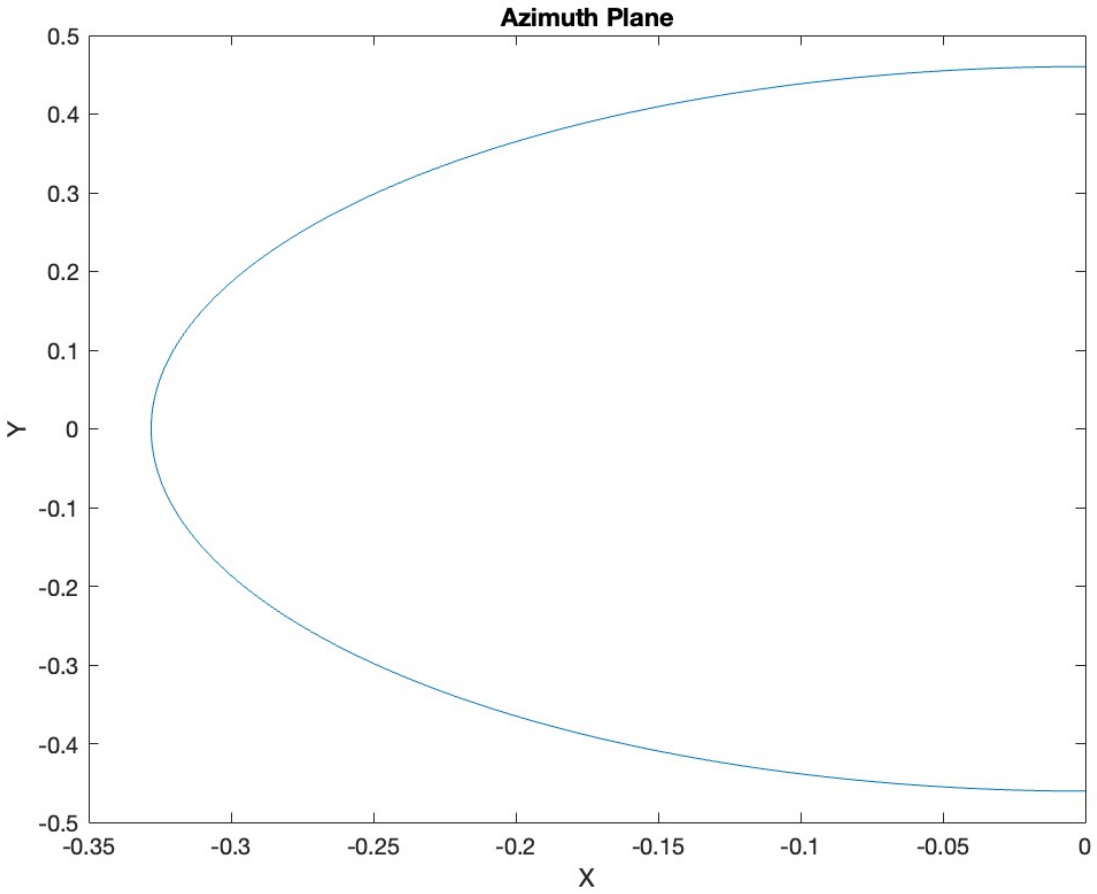
```
% for loop for iterating over array which stores
the location data of every user for every frame
for index1 = 1:(numFrames*20)


 % if to check condition whether
if ((B(3,:,index1))== 0 && abs(B(4,:,index1))<1 )


    if B(1,:,index1)== index2. %store count for a
%frame
    count=count+1;
    count_1(B(1,:,index1))=count;  % array to store
% count for each frame
    end
 end


% end of inner for
end
% end of outer for
end
```

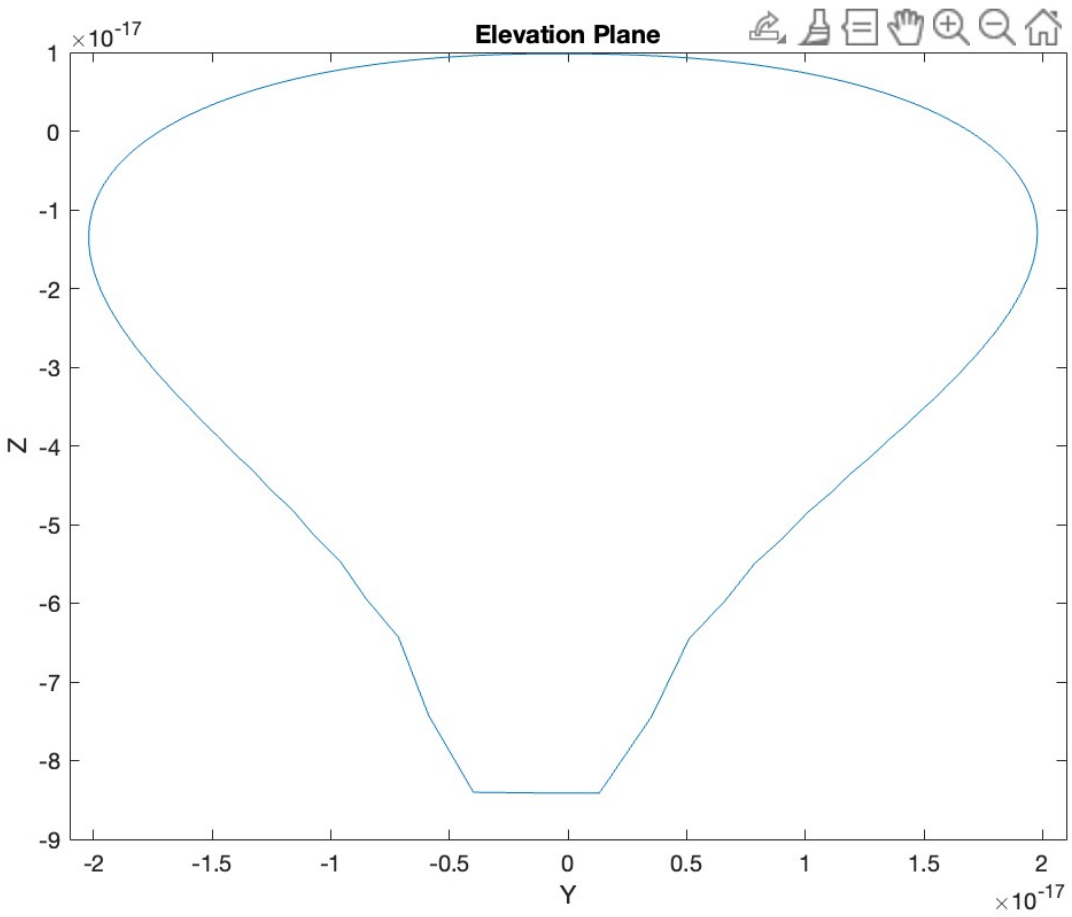
4 Screenshots

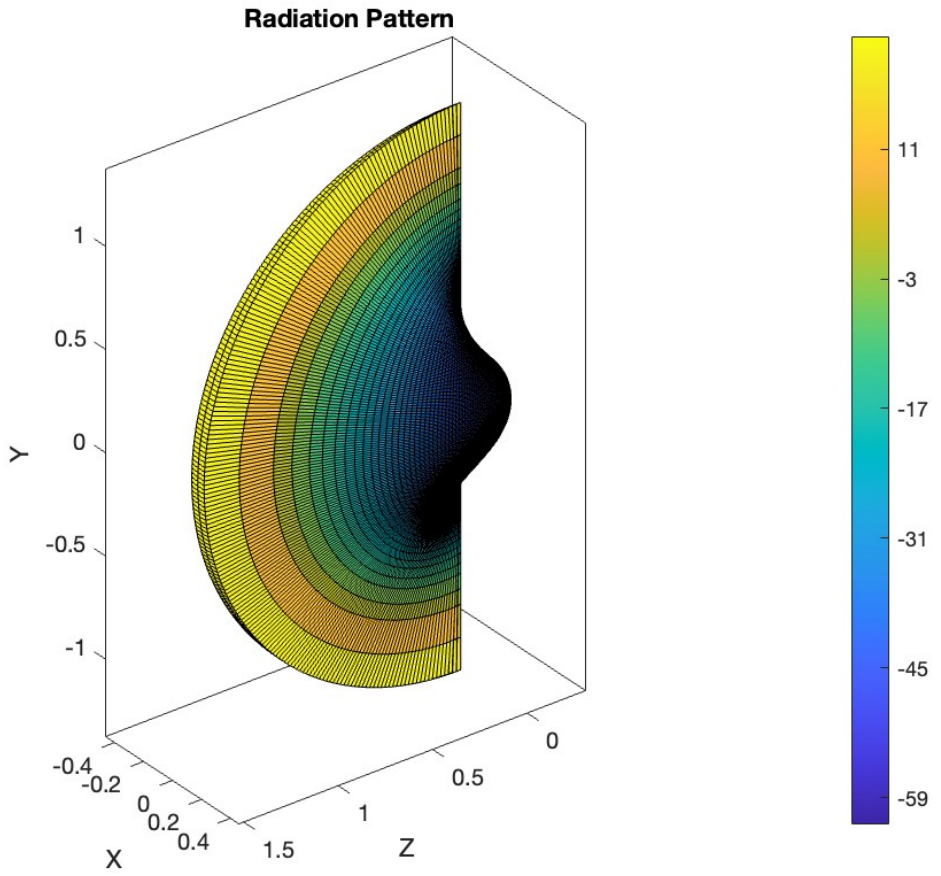


5 Graphs

The following graphs indicate the radiation pattern of Horn Antenna




Elevation Plane
×10^-17
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
Z
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
Y
×10^-17


Radiation Pattern
1
0.5
0
-0.5
-1
Y
-0.4
-0.2
0
0.2
0.4
X
1.5
1
0.5
0
Z
11
-3
-17
-31
-45
-59

6 Results

The screenshot below shows number of users in a particular cell at a particular frame.Every column represents a specific frame. Every row represents a specific cell

```
Every column represents a specific frame. Every row represents a specific cell
     6    12    14    17    18    18    16    13     8     5

     0     0     0     0     0     0     0     1     1     2

     2     3     3     2     2     2     2     2     2     4

     0     0     0     0     0     0     2     4     6     6

     5     4     3     1     0     0     0     0     2     2

     1     1     0     0     0     0     0     0     1     1

     6     0     0     0     0     0     0     0     0     0
```

7 Discussion

In this homework a simulation was done for mutliple users situation. Values of number of users in each cell for each frame was stored in arrays. The cells were divided into 120 degree sectors.

Radiation Pattern was plotted for Horn Antenna.

8 Running the Matlab code

Open all the files. Run sectors.m for simulating multiusers in sectorised cells. Run the radiationplot.m for plotting radiation