

Homework 3 submission

ECET 512 — Wireless Systems



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1 Submitted files

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

1.1 SRC Folder

- + "*multiusers.m*": Running this function simulates multiple user scenario. 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.
- + "*handoff.m*": Running this function simulates handoff scenario. This function calls other subroutines and finally gives the output of handoff video and generates the graphs for power received during handoff.
- + "*drawCell.m*": This function was given for the homework.
- + "*drawCluster.m*": This function allows the user to plot a cluster of N cells with N being 3,4 and 7 only as asked.
- + "*drawCluster1.m*": This function allows the user to plot a single cluster to simulate handoff
- + "*ServingCell2.m*": This function computes the serving cell and connects the user with centre of the serving cell.
- + "*ServingCell3.m*": This function computes the serving cell and connects the user with centre of the serving cell.

1.2 DOC Folder

- + "*multi-users.avi*": This video shows multiple users moving across clusters
- + "*handoff.avi*": This video shows handoff situation.
- + "*graph1.jpg*": This represents the graph of the power received through both the base stations in a handoff situation with shadowing enabled.
- + "*graph2.jpg*": This represents the graph of the power received through both the base stations in a handoff situation with shadowing disabled.

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 )

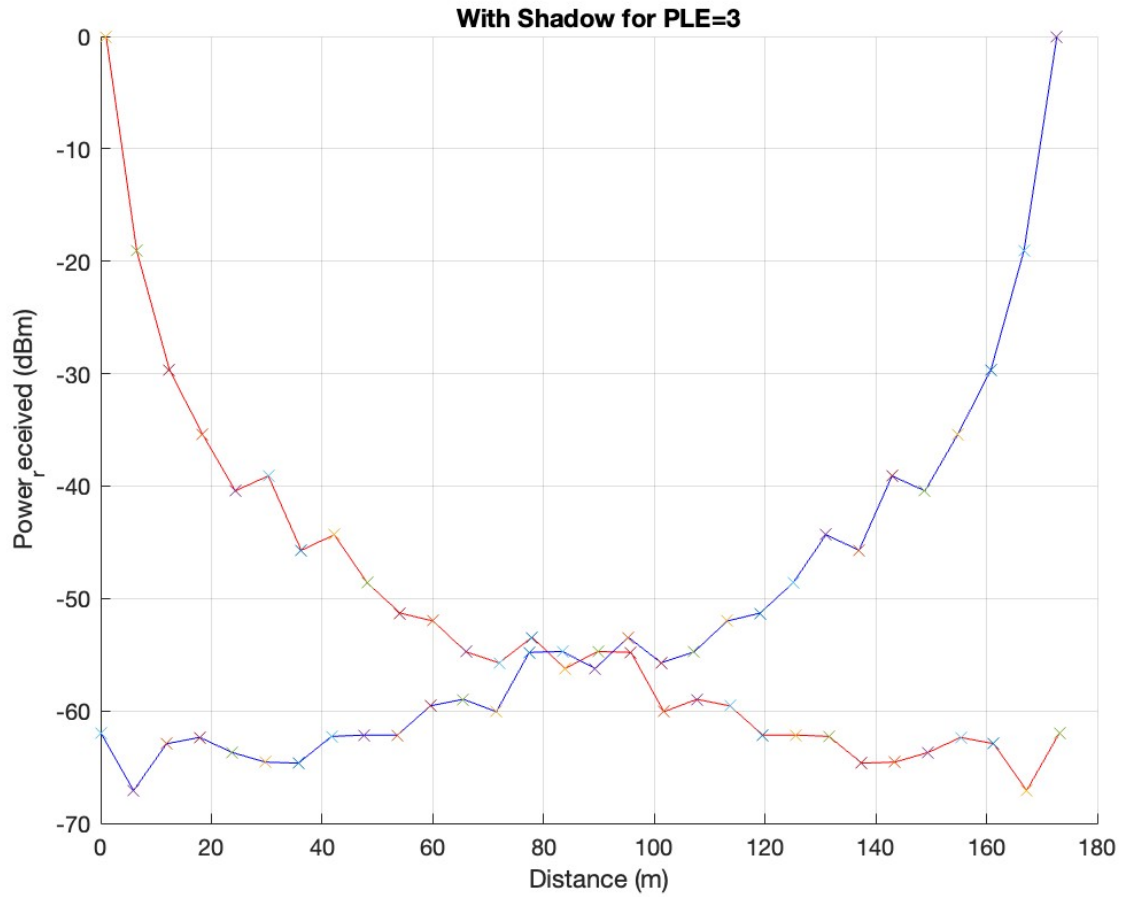
        if B(1,:,index1)== index2. %store count for a
%frame
            count=count+1;
            count_1(B(1,:,index1))=count; % array to store
% count for each frame
        end
    end

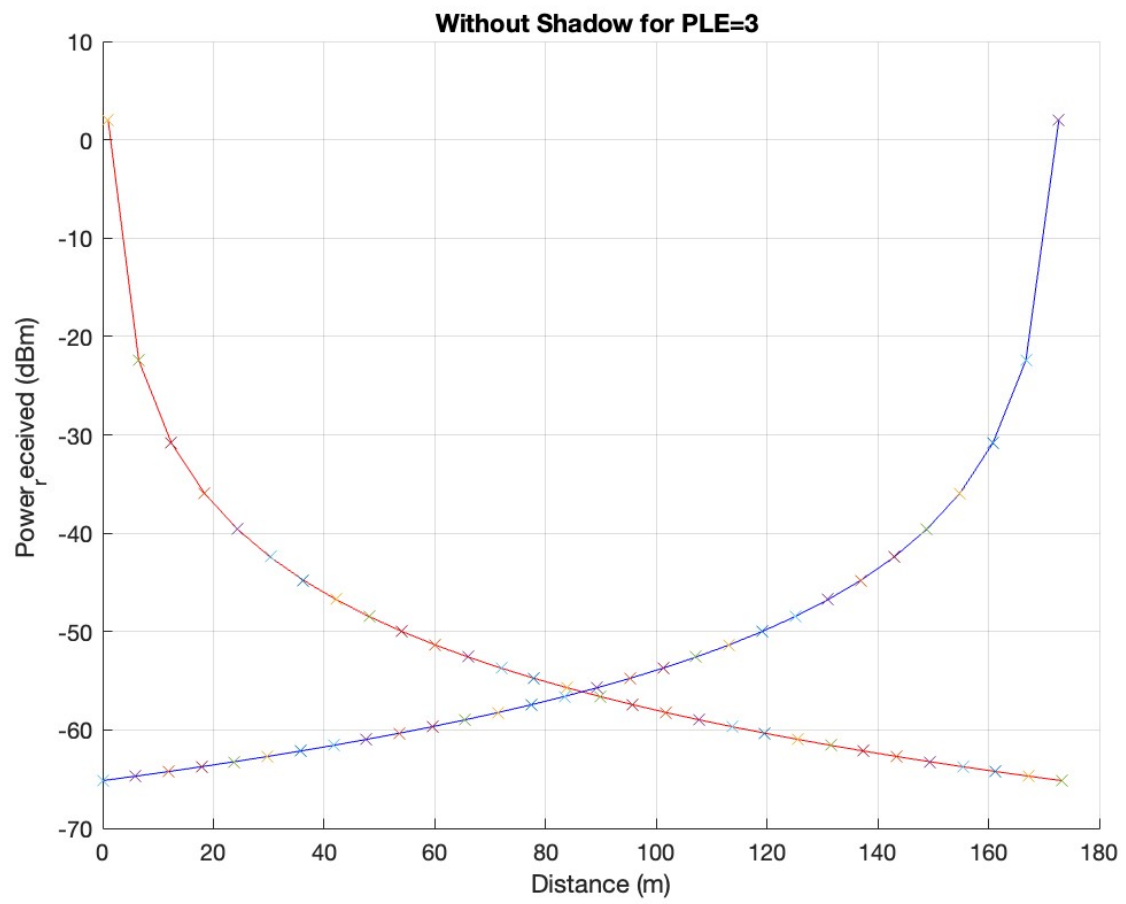
% end of inner for
end

% end of outer for
end
```

4 Graphs

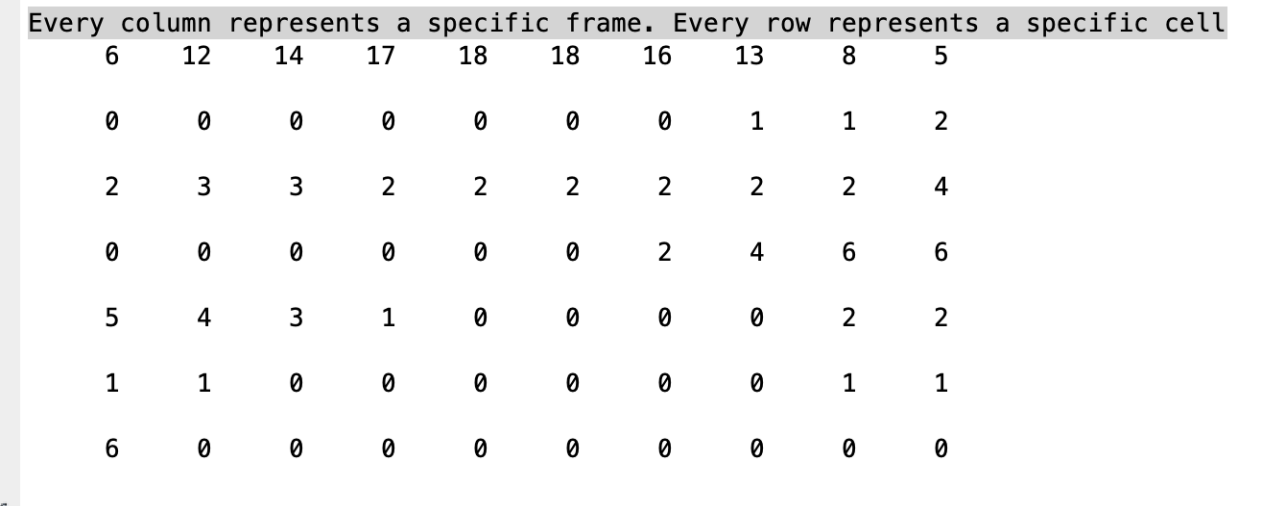
The red line indicates power received from one base station while the blue line indicates the power received from another base station. Graphs are plotted with shadowing off and shadowing on. The intersection point of both power levels is the location where power is equal.





5 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



A screenshot of a table with a light gray background. The table has 10 columns and 7 rows. The first row contains frame numbers: 6, 12, 14, 17, 18, 18, 16, 13, 8, 5. The subsequent rows contain user counts for each of the 10 cells. The text 'Every column represents a specific frame. Every row represents a specific cell' is written in a smaller font above the table data.

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

6 Discussion

In this homework a simulation was done for multiple users situation. Values of number of users in each cell for each frame was stored in arrays.

Graphs were generated for power received from both the base stations in handoff situation.

7 Running the Matlab code

Open all the files. Run `multiusers.m` for simulating multiusers. Run the `handoff.m` for simulating handoffs.