FINAL REVIEW REPORT

Submitted as part of

CSE1006 Network and Communication

To

Prof. Umadevi.K.S

By

15BCE0158

AVIRAL SRIVASTVA

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

VIT UNIVERSITY

(Estd. u/s 3 of UGC Act 1956)

www.vit.ac.in

Introduction to Architecture

Over the last decade warming has become an progressively important item on the world political agenda. In this regard, having a share of additional than two already in 2007 with a robust trend to extend, info and communication technologies (ICTs) are known to be a significant future contributor to overall inexperienced house gas emissions, so as to scale back the environmental impact of ICT, efforts to extend energy potency of those technologies have considerably gained momentum. joined branch of the sector, mobile radio networks account for regarding zero.

However, with rising demand for communication services in developing countries, wants of mobile radio networks area unit expected within the future are serious challenges with relevance energy.2% of world emissions, contributory a rather tiny portion to the general carbon footprint of ICT nowadays [2], [3].

In addition to minimizing the environmental impact of the industry, cellular network operators area. the prices for running a network area unit largely laid low with the energy bill and vital savings in capex and opex may be complete through reduced energy wants [4], [5]. It is yet interested in decreasing the energy consumption of their networks for economical reasons

Currently over eightieth of the facility in mobile telecommunications is consumed within the radio access network, more specifically the bottom stations.
First by optimization of individual sites, e.g., through the utilization of additional economical and cargo adjustive hardware elements further as computer code modules.
Secondly, by improved preparation ways, effectively lowering the number of websites needed within the network to meet bound performance metrics like coverage and spectral potency.

Taking this into consideration, there are in essence 2 levers to lower the energy consumption of these networks. Interdependencies, however, do exist if website optimization affects the link budget. For instance if the receiver sensitivity is down through improved RF elements. In principle, gains achieved in one space square measure complimentary to gains achieved within the different, i.e., if the preparation is optimized with reference to an exact coverage, further energy saving might be realized through website optimization

LITERTURE REVIEW

With respect to network preparation, it's usually believed that topologies that includes high density deployments of little, low power base stations improve the network's energy potency compared to denseness deployments of few high power base stations [4].

Here we introduce ideas to assess and optimize the energy consumption of a cellular network model consisting of a combination of regular macro sites further as variety of smaller devices which we tend to here consult with as small base stations.

Compared to the former, the latter cowl a far smaller space however feature accordingly lower energy consumption figures.

Additionally, the areas lined by small base stations typically fancy much higher average signal to interference and noise ratios (SINRs) because of advantageous path loss conditions and shorter propagation distances.

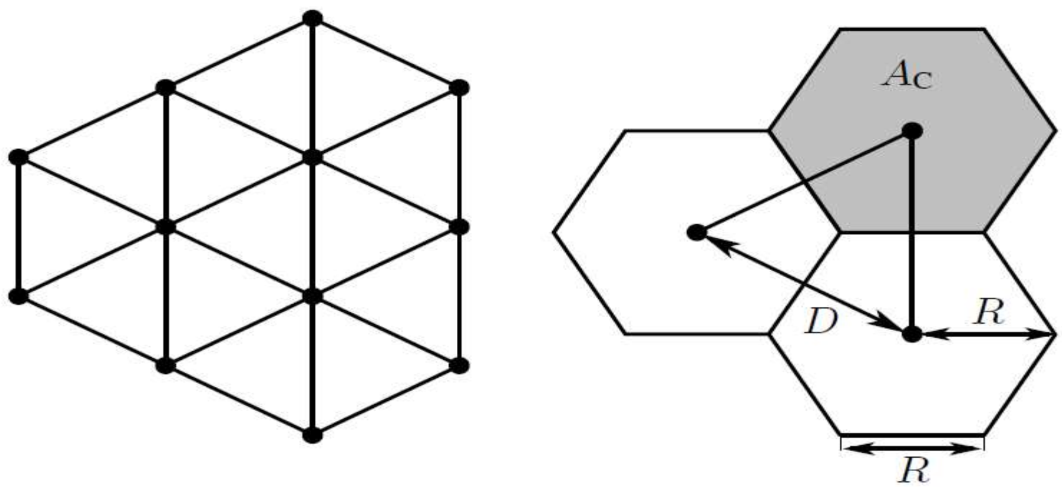
In previous contributions preparation methods area unit normally investigated with relevancy spectral potency, coverage, or outage likelihood. Investigations with respect to profitableness and value structure of mixed topologies consisting of macro, micro, and pico cells area unit conducted in [4].

In [5] the notion of spectral potency per unit space is introduced to live the performance of cellular mobile radio systems. this idea is additionally utilised here for frequency recycle one networks. additionally, we tend to characterize a network's power consumption in Watts per unit space for given coverage and spectral potency needs and optimize the bottom station density with relevancy this figure of advantage.

We tend to conjointly offer simple models for the ability consumption of various base station varieties and derive sure characteristics for small base stations to boost the general energy consumption figures of a network.

Proposed Solution

We model the macro base station network as an infinite regular grid of websites characterised by the positioning distance D, generating equally sized polygon cell structures of side length $R = \frac{D}{\sqrt{3}}$ as represented in Fig



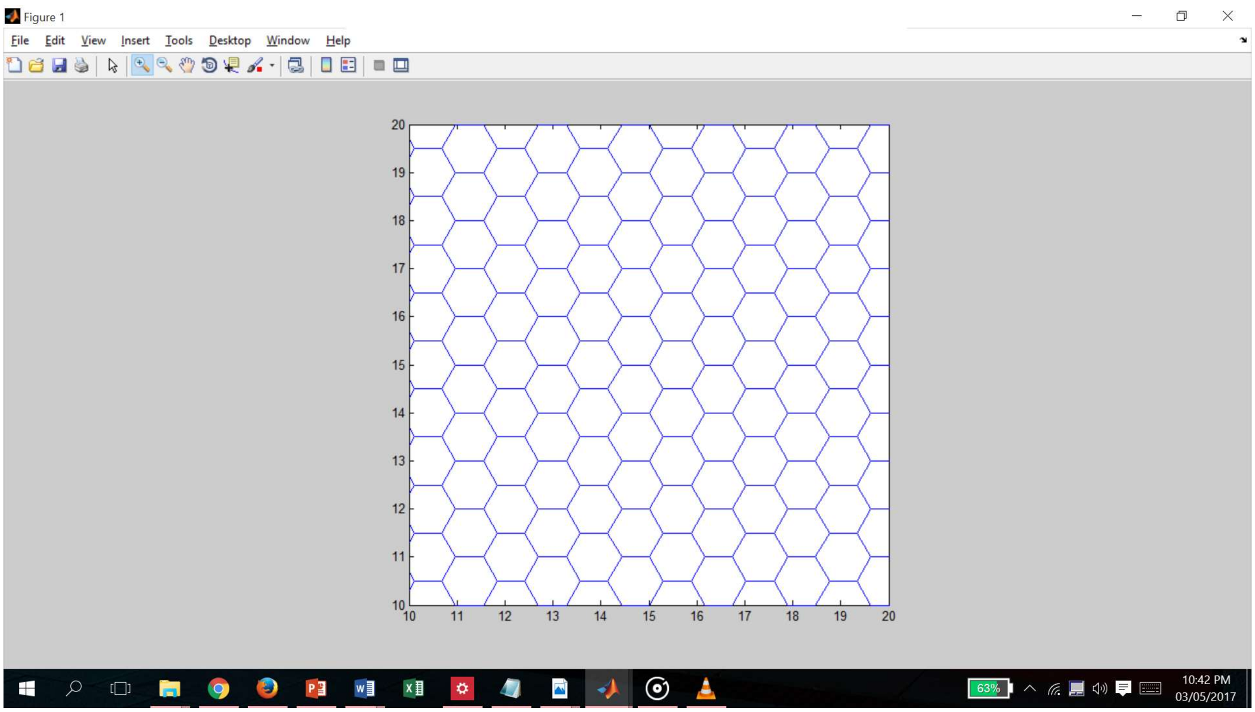
during this report we have a tendency to use the term cell to talk to the polygon Voronoi region of 1 site. every cell could be any divided into many sectors. For given repose website distance D, the cell size AC then calculates as $AC = \frac{3\sqrt{3}}{2} R^2$. Here we have also assumed to find the traffic density to be uniformly distributed over the geometer plane.

By using cellular tracking , we can track the location and the position of the user in any particular network as w.r.t. to the direction in which it is moving . We can also finding the pattern of acceleration of the user in x-axis as well as y-axis and can find the speed of their motion by checking the rate of change of the network in the region.

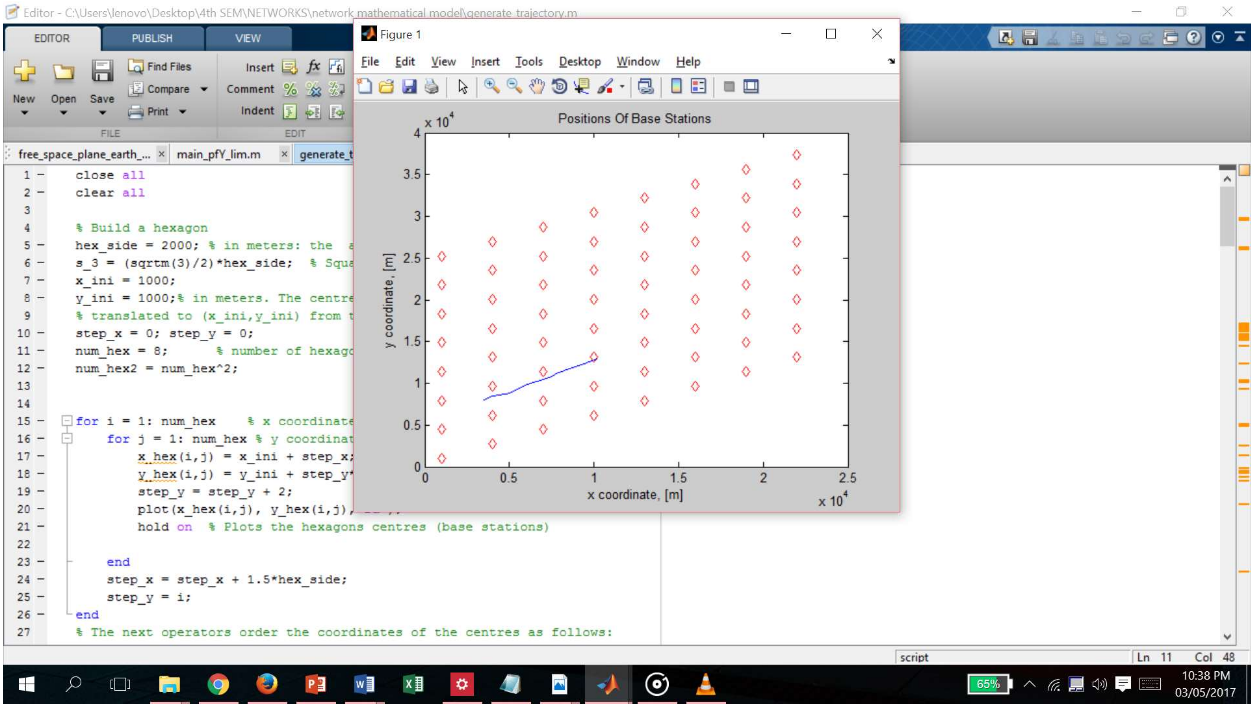
We have also suggested and implemented path-loss model for commercial buildings and for other similar structures and have combined our results accordingly.

IMPLEMENTATION

We have applied MATLAB to initially make a hexagonal model and then



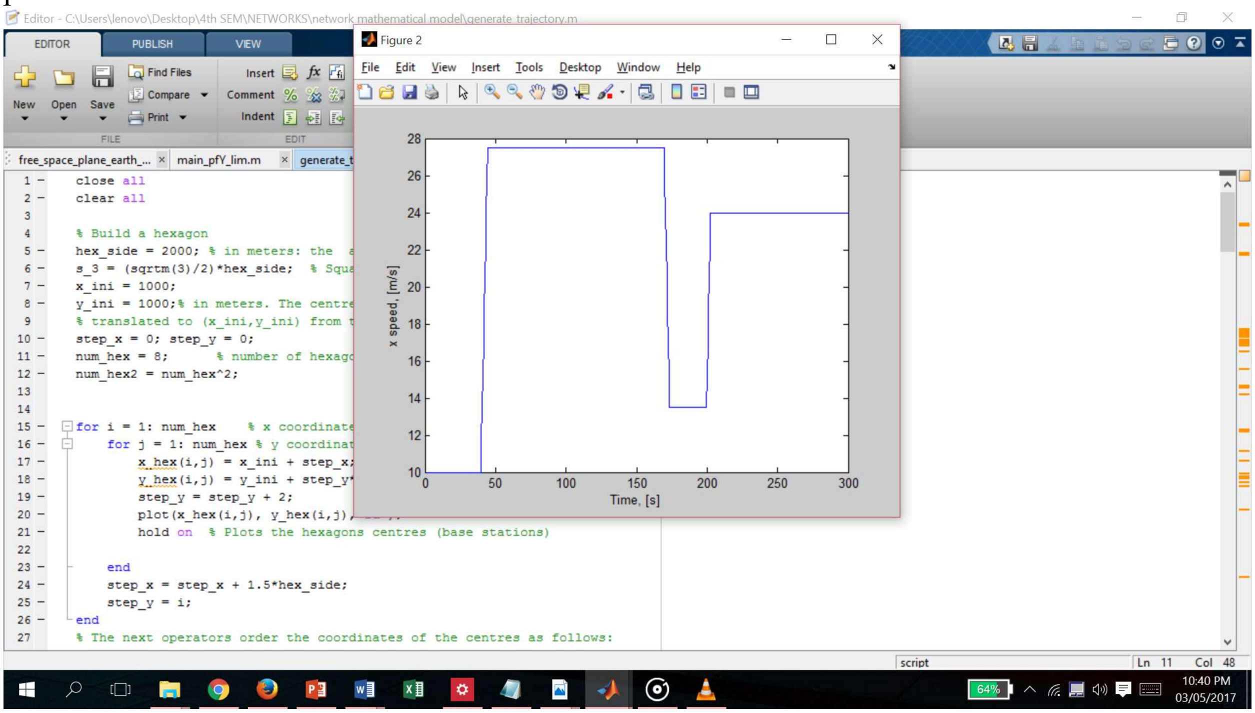
We have then implemented with MATLAB code for finding the position of base stations in the region for detecting user moving direction.



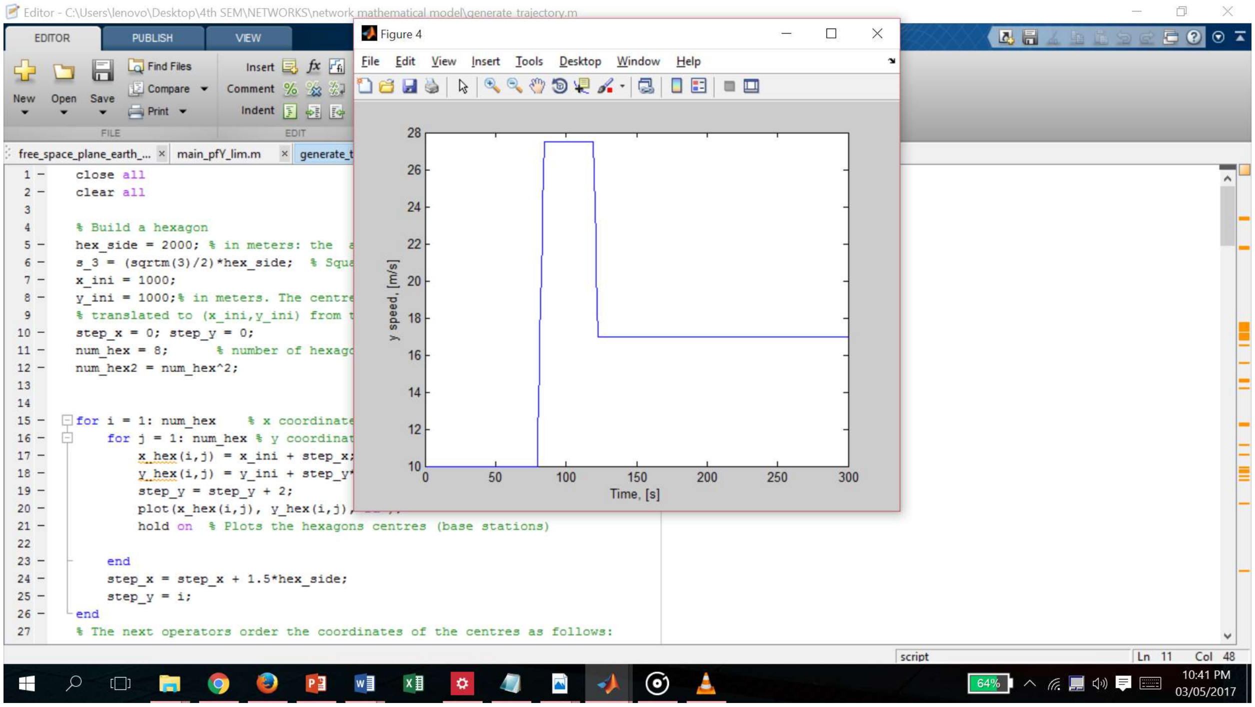
Editor - C:\Users\lenovo\Desktop\4th SEM\NETWORKS\network mathematical model\generate_trajectory.m
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
FILE
Insert
Comment
Indent
EDIT
free_space_plane_earth_...
main_pfY_lim.m
generate_t
close all
clear all
% Build a hexagon
hex_side = 2000; % in meters: the
s_3 = (sqrtm(3)/2)*hex_side; % Squa
x_ini = 1000;
y_ini = 1000;% in meters. The centre
% translated to (x_ini,y_ini) from t
step_x = 0; step_y = 0;
num_hex = 8; % number of hexago
num_hex2 = num_hex^2;
for i = 1: num_hex % x coordinate
for j = 1: num_hex % y coordinat
x_hex(i,j) = x_ini + step_x;
y_hex(i,j) = y_ini + step_y*
step_y = step_y + 2;
plot(x_hex(i,j), y_hex(i,j),
hold on % Plots the hexagons centres (base stations)
end
step_x = step_x + 1.5*hex_side;
step_y = i;
end
% The next operators order the coordinates of the centres as follows:
Figure 1
File
Edit
View
Insert
Tools
Desktop
Window
Help
Positions Of Base Stations
x 10^4
y coordinate, [m]
x coordinate, [m]
script
Ln 11
Col 48
65%
10:38 PM
03/05/2017

PERFORMANCE METRICS

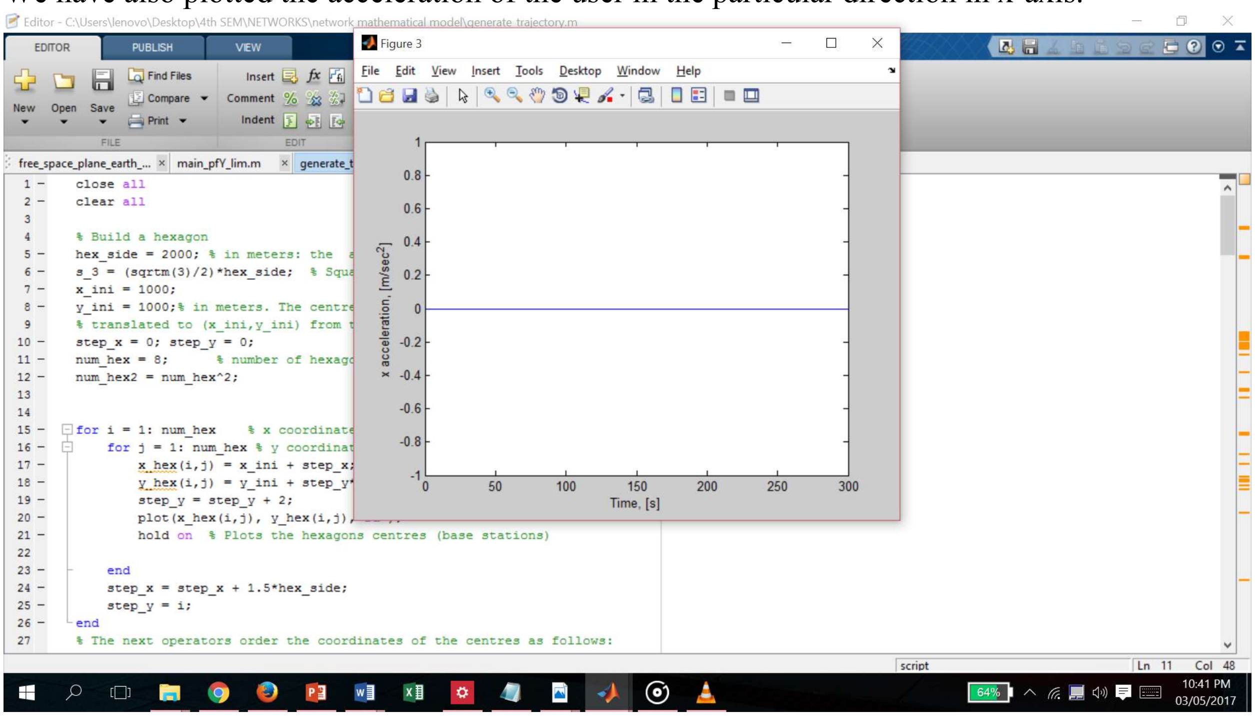
For finding the main aim of user tracking ,we have also plotted a graph to analyse the motion of the user w.r.t. its speed in x-axis and time ,so as to check the effectiveness of the code as per its performance metric.



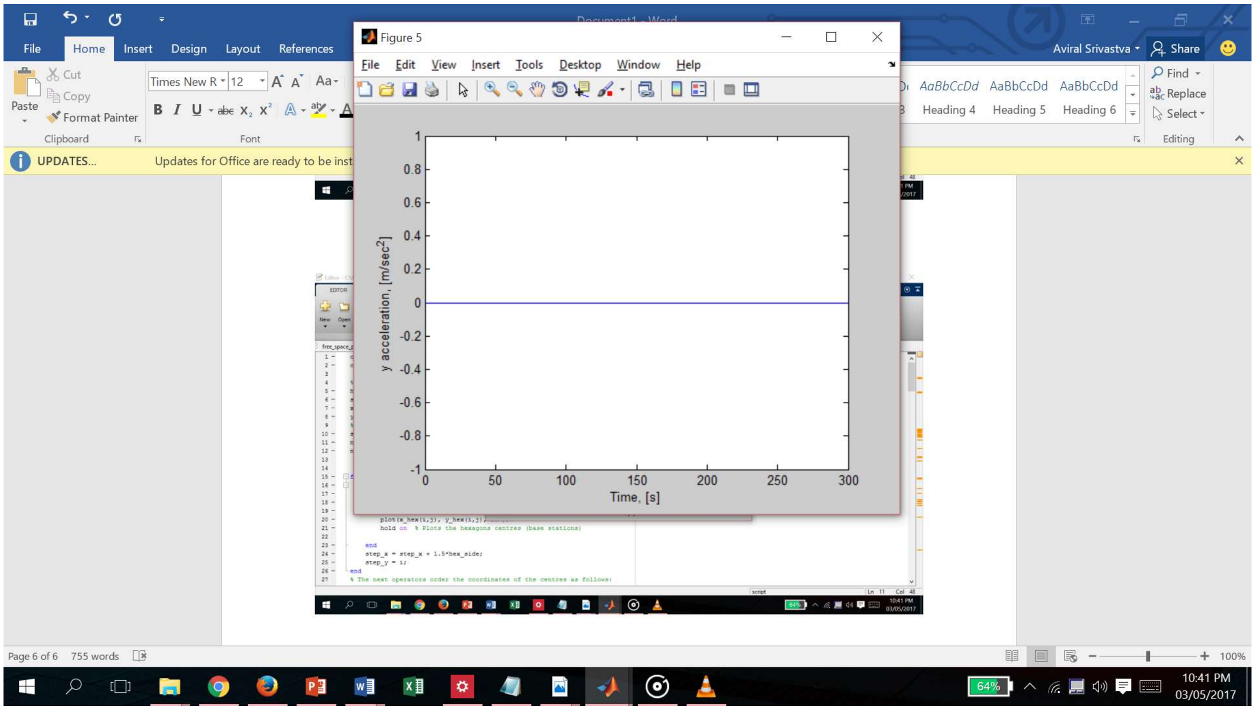
Similarily for speed of the user in y-axis, as the motion



We have also plotted the acceleration of the user in the particular direction in x-axis.



And similarily for y-axis



For performance metrics , we have also plotted the graph for different types of errors namely ME(Mean Error) and RMSE(Root Mean Square Error).

Here I have plotted the graph for the position of the user in x-axis by finding mean error. And similarily for y-axis.

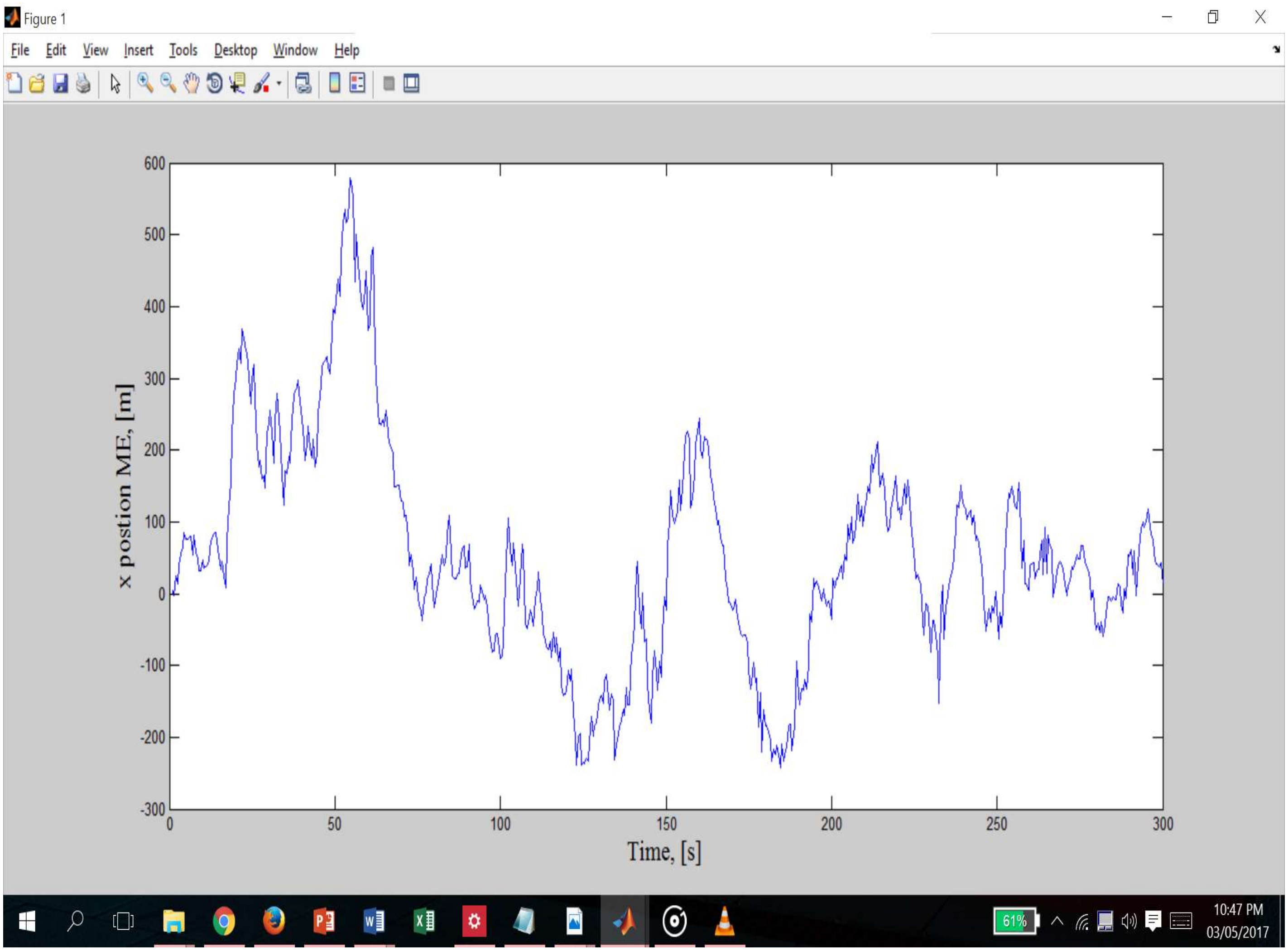
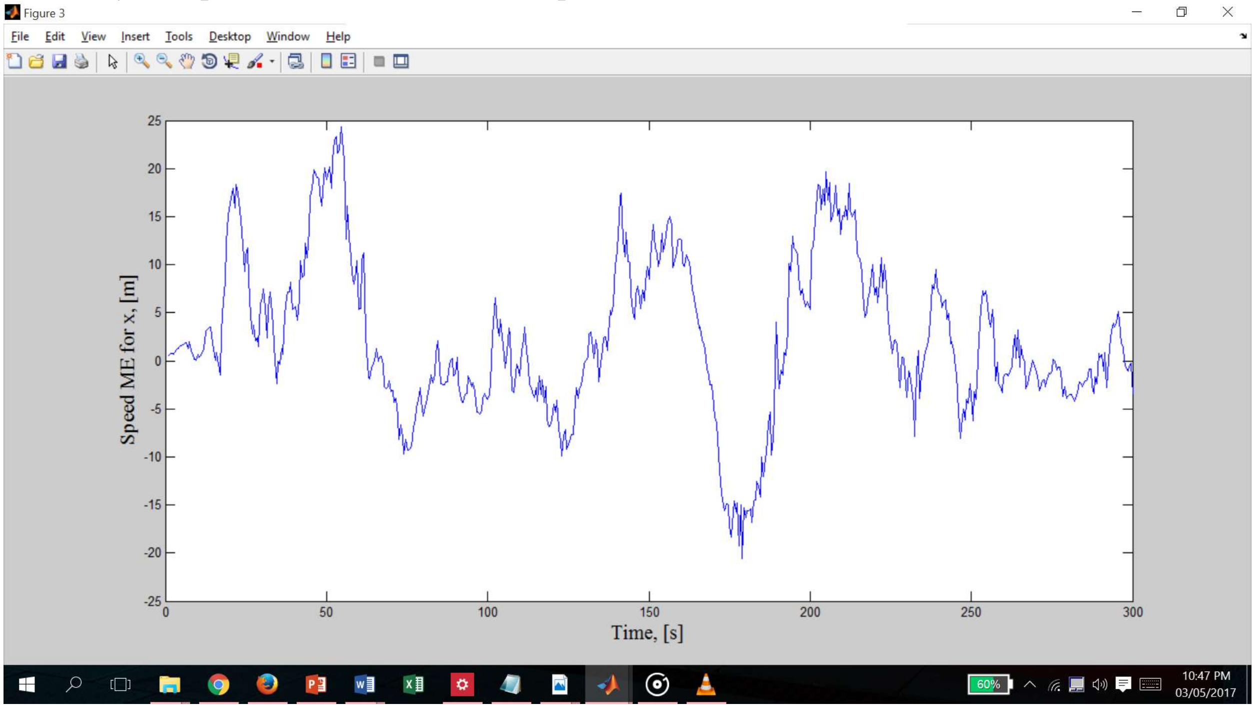
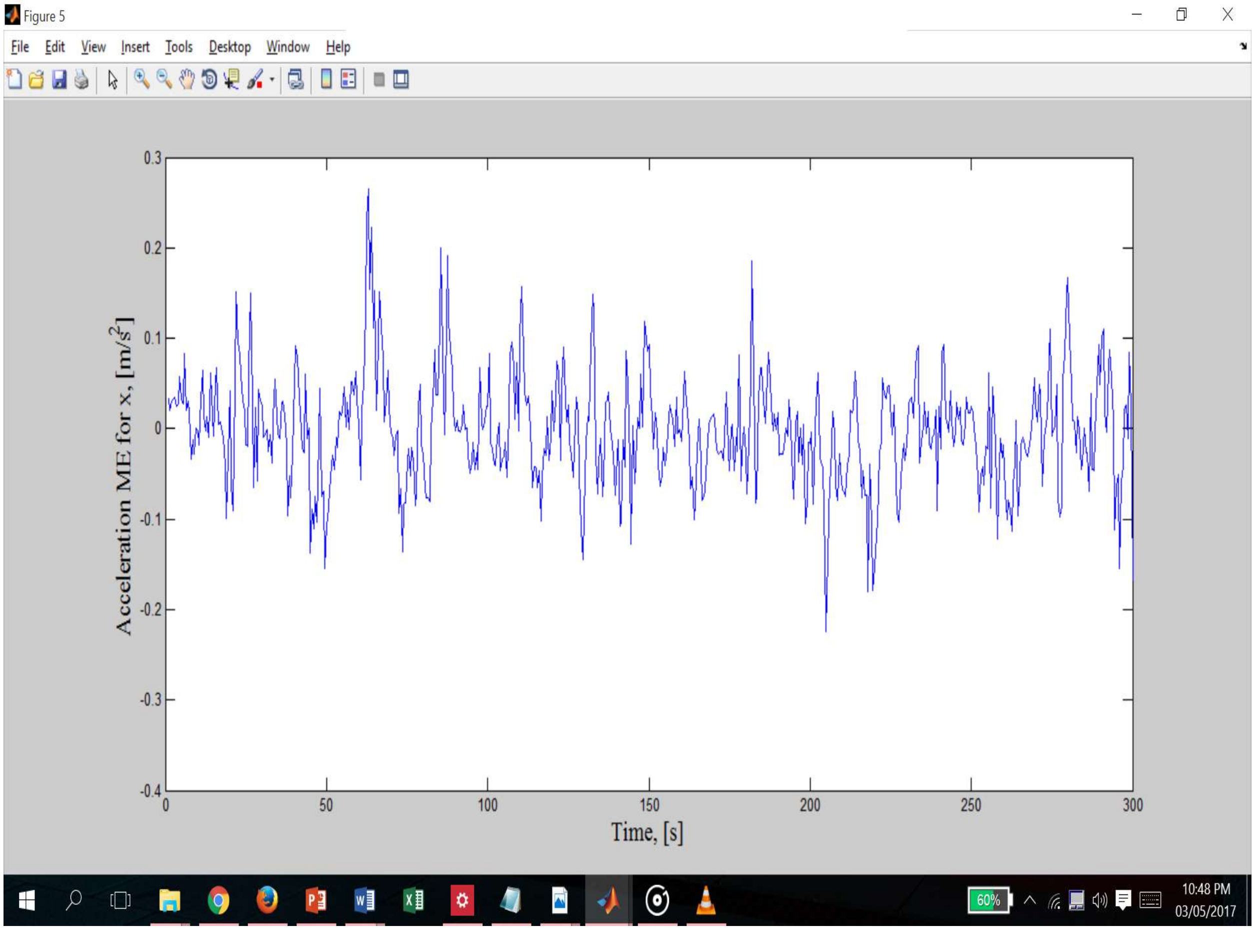


Figure 1
File Edit View Insert Tools Desktop Window Help
600
500
400
300
200
100
0
-100
-200
-300
0
50
100
150
200
250
300
x postion ME, [m]
Time, [s]
61%
10:47 PM
03/05/2017

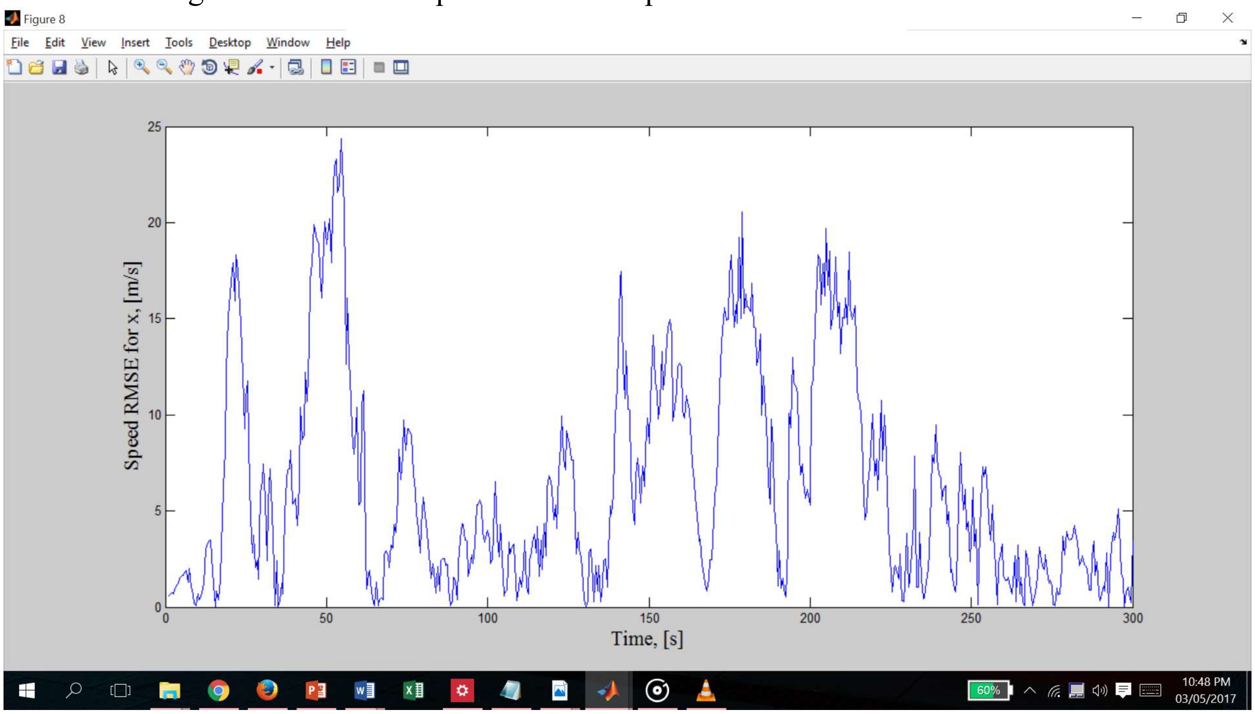
Similarily , we plotted the Mean Error for speed in x-axis



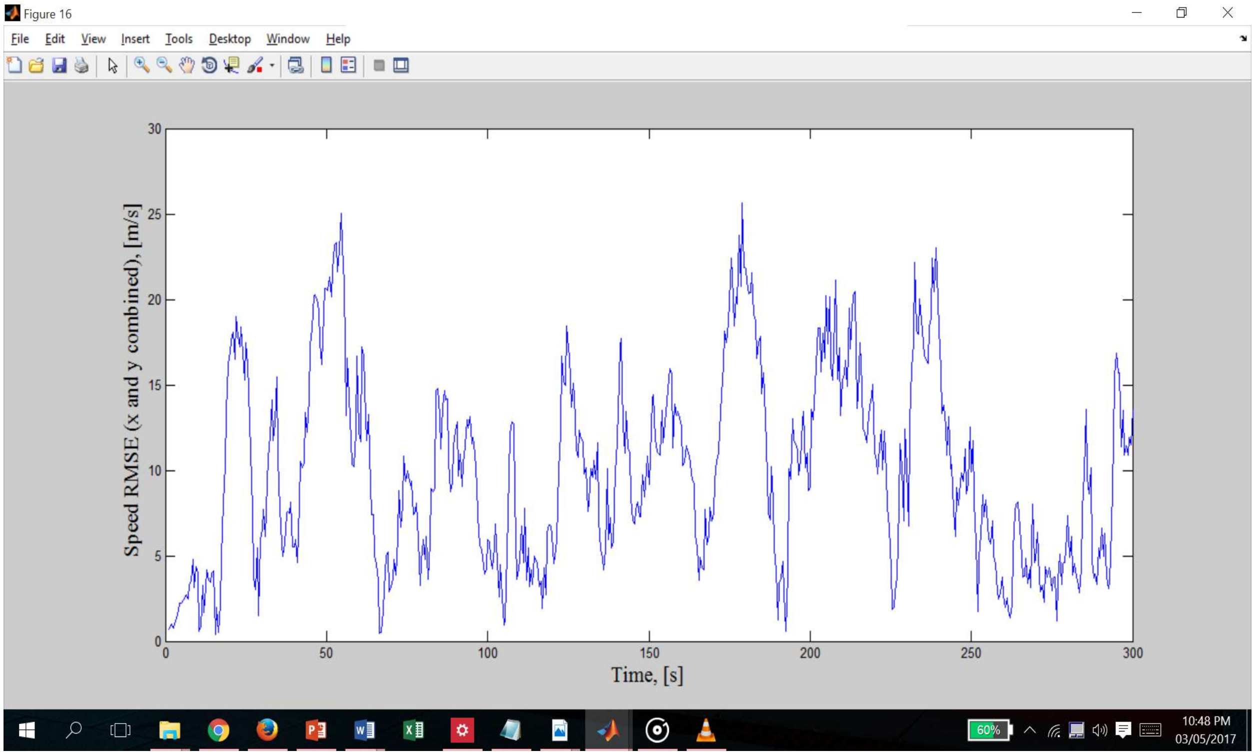
And Similarily for Mean Error for acceleration in x-axis

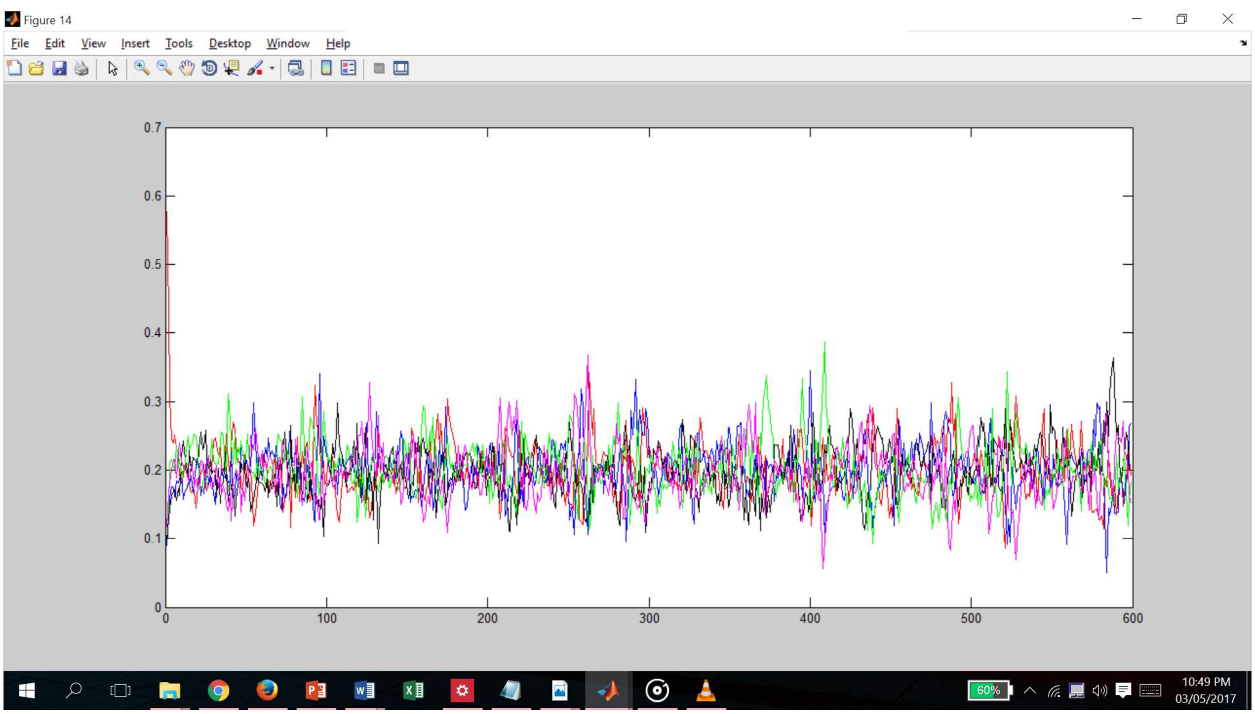


And for finding the Root Mean Square Error for Speed w.r.t. x-axis

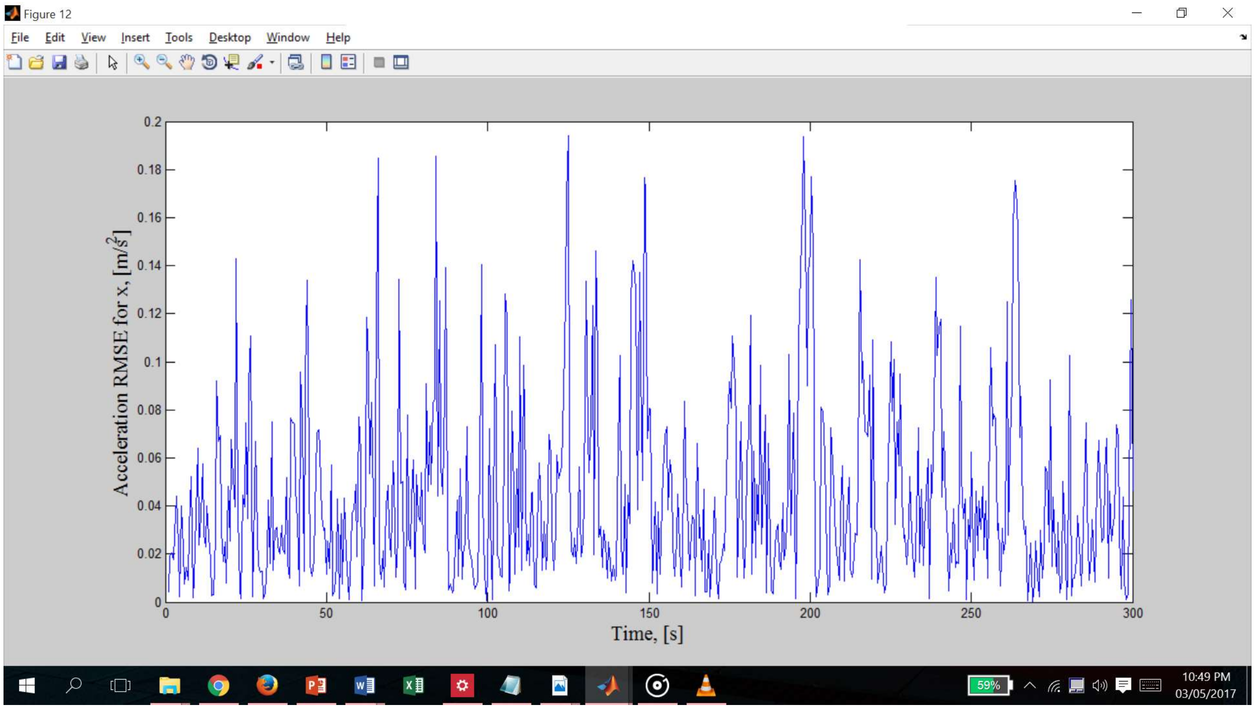


And Similarily for RMSE Speed with x and y axis combined





Here we have calculated the acceleration of RMSE in x-axis and similarily for y-axis



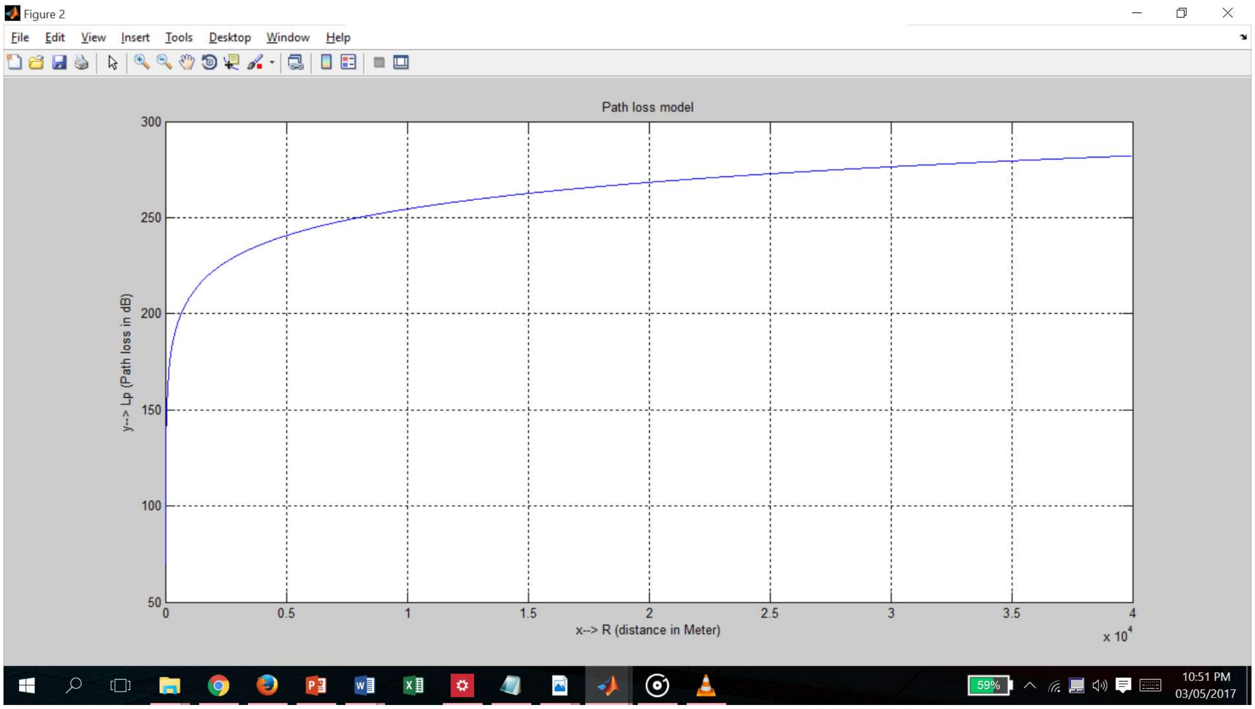
PERFORMANCE ANALYSIS

In business building environments, there exist a range of interior partitions and obstacles. Partitions vary drastically in their physical and electrical characteristics. thanks to this complexity, it's tough to accurately live and derive a general path loss model. we have a tendency to use the subsequent approach to balance accuracy and flexibility.
For the trail loss at intervals a similar floor, we have a tendency to adopt the following equation to model path loss (in dBm)

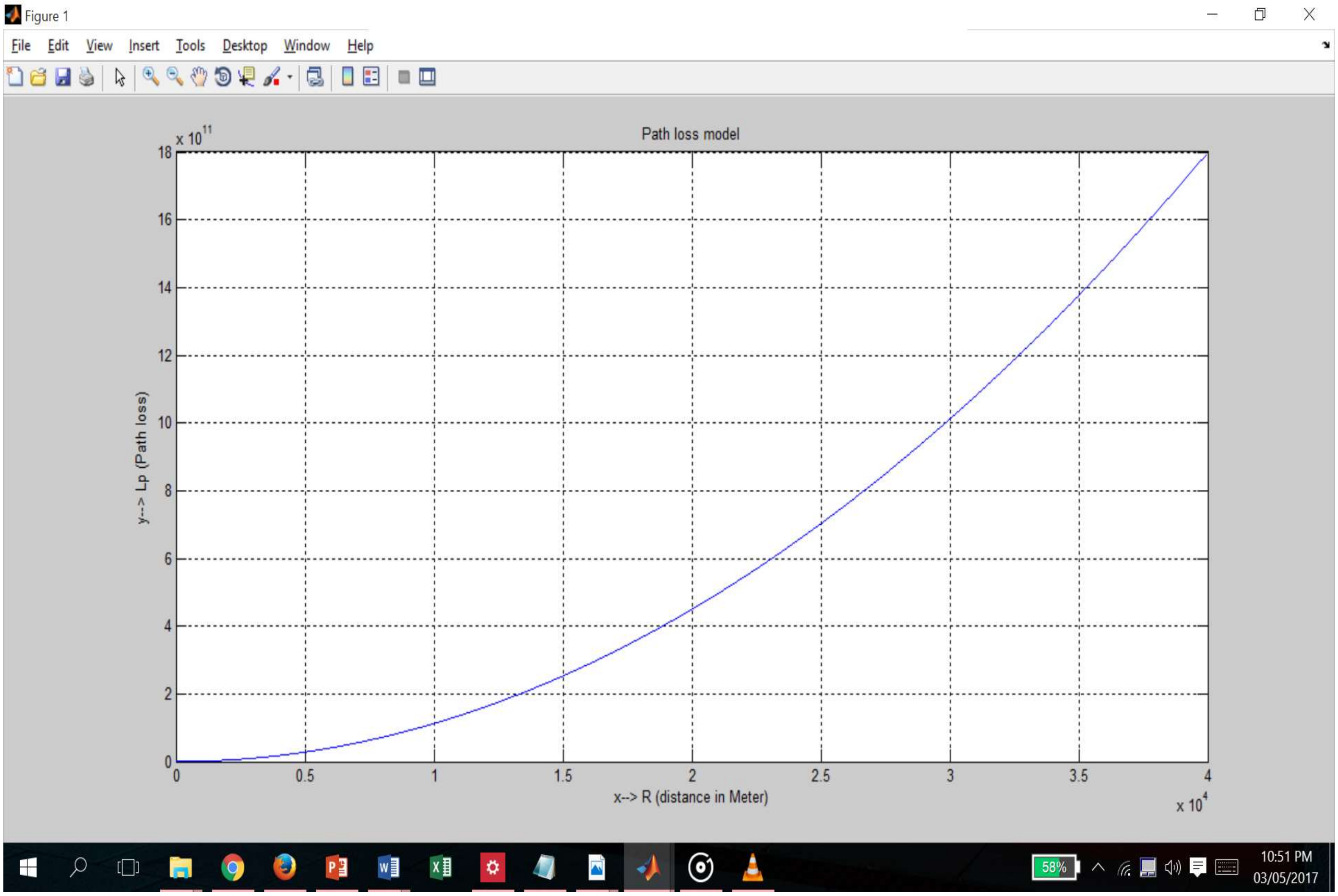
$$P_{R_m} = P_{T_i} - L_{d_0} - 10\alpha \log_{10}\left(\frac{d_{im}}{d_0}\right),$$

where PRm is that the received power at FBS m (measured over multiple frames to average out the quick attenuation effect); PTi is the transmission power from the purpose in militia i that's furthest faraway from FBS m ; dim represents the distance between militia i and FBS m as outlined in (1); d0 could be a short reference distance; Ld0 represents the signal loss (dB) at distance d0; and á denotes the trail loss exponent, indicating the rate at that the signal is attenuated with reference to dim. Since researchers have conducted in depth measurements to determine á for an oversized variety of partition varieties , this permits North American country to use completely different values of á to model different buildings.

Here, we have plotted the graph for path loss in dB w.r.t. distance in meters

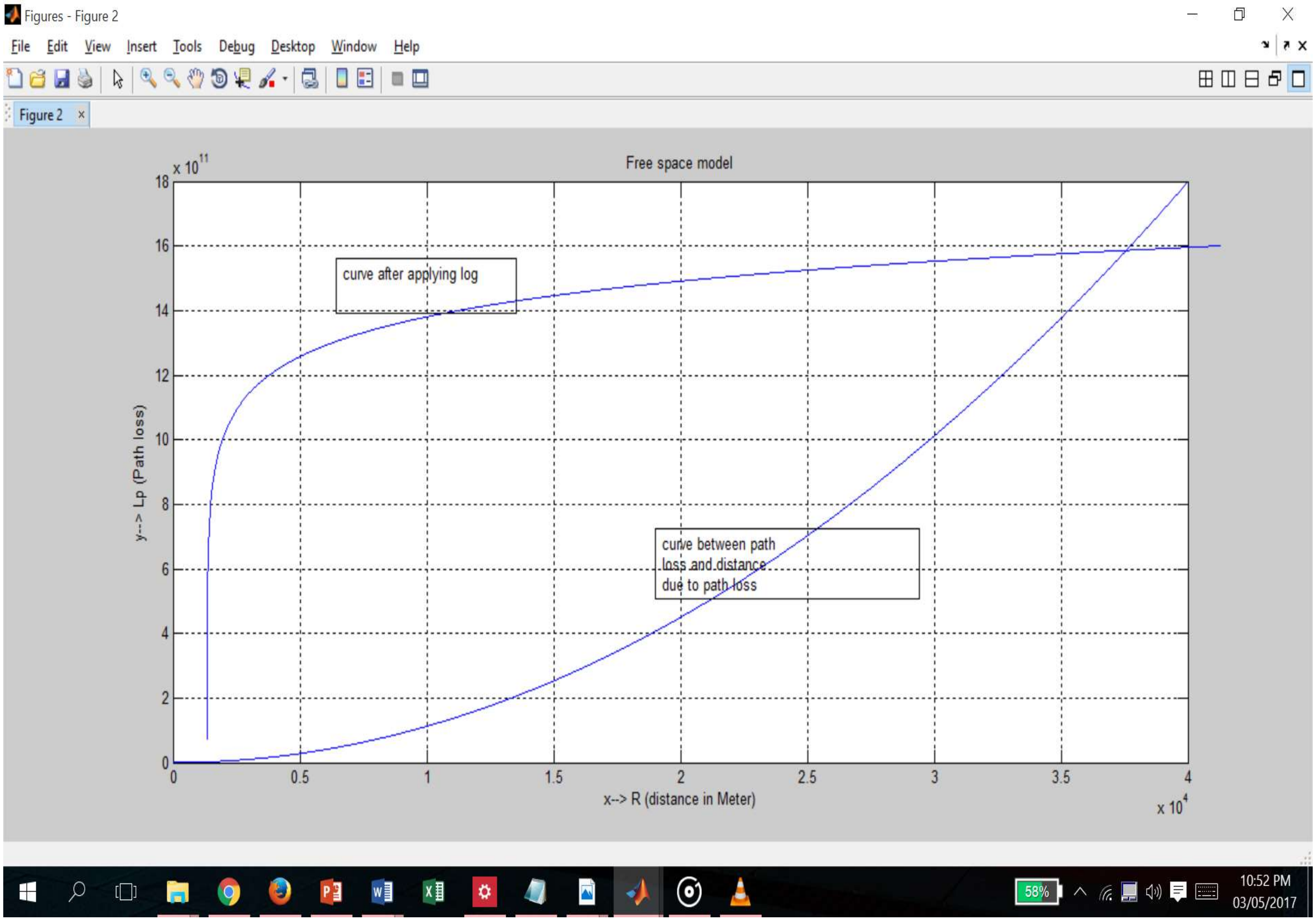


And subsequently for finding graph for the logarithmic function of the path loss w.r.t. distance in meters.



I have also merged the two graphs plotted before and after applying logarithm for the free space model.

And then plotting the two curves in a single graph



Figures - Figure 2
File Edit View Insert Tools Debug Desktop Window Help
Figure 2
Free space model
x 10^11
18
16
14
12
10
8
6
4
2
0
y--> Lp (Path loss)
curve after applying log
curve between path
loss and distance
due to path loss
0
0.5
1
1.5
2
2.5
3
3.5
4
x--> R (distance in Meter)
x 10^4
58%
10:52 PM
03/05/2017

FUTURE WORK

This feature of user tracking and path loss modelling can lead to greater changes in overall detection of movement of the user in any particular direction with the amount of speed and its acceleration without using any kind of GPS tracking devices embedded in the phone of the user. We can further work on reducing the amount of energy used by base stations in its functioning as well as in its deployment strategies.

CONCLUSION

We investigate on the total role of strategies for their deployment as per the role of power consumption for all kinds of mobile radio networks. We have kept in mind the complete layouts thus obtaining the huge numbers of such micro sites per cell also to the addition for the conventional macro sites. Here we found the interesting concept for the area power consumption to be used for their system performance metric which is therefore used to employ simulations to check and verify the chances of improvement of this metric through the use of micro base stations. We have also successfully implemented the path loss model and was able to find combined curve for both normal path loss model and for logarithm form of path loss model.

REFERENCES

[1]. M. S. Alouini and A. J. Goldsmith, "Area spectral efficiency of cellular mobile radio systems," *IEEE Trans. Veh. Technol.*, vol. 48, no. 4, pp. 1047–1066, July 1999.

[2]. S. Hanly and R. Mathar, "On the optimal base-station density for CDMA cellular networks," *IEEE Trans. Commun.*, vol. 50, no. 8, pp. 1274–1281, Aug. 2002.

[3]. K. Johansson, "Cost effective deployment strategies for heterogeneous wireless networks," Ph.D. dissertation, KTH Information and Communication Technology, Stockholm, Sweden, November 2007.

[4]. Goldsmith, *Wireless Communications*. New York, NY, USA: Cambridge University Press, 2005.

[5]. IST-4-02-7756 WINNER II, *D1.1.2 V1.2 WINNER II Channel Models*, September 2007.

[6]. Corliano and M. Hufschmid, "Energieverbrauch der mobilen kommunikation," Bundesamt f¨ur Energie, Ittigen, Switzerland, Tech. Rep., February 2008, in German.