Assignment 3, Wireless Communication Channels

This assignment deals with positioning, especially positioning based on received signal strength (RSSI) from different base stations. Based on measurement data received from an Android phone and the app RF signal tracker you should do two things:

1. Estimate the propagation exponent from the received RSSI values.
2. Find an estimate of the position based on RSSI values from a number of base stations.

RF signal tracker

The app can be used as a logger for the RSSI where the current location is stored together with the signal strength. The position of the base station in use is stored together with the current position in geodetic coordinates ("lat, long"-format). Depending on the actual phone used there is a limited resolution in the RSSI values reported, but we have to live with that.

Coordinate formats

Instead of geodetic coordinates grid coordinates, such as the Swedish national SWEREF99 coordinate system, can be used. In SWEREF99 the earth is given coordinates with a one meter resolution. Each position is represented by a (x,y) coordinate instead, where x is north, and y is east.

Coordinates in any reference system can be plotted on a map at, e.g., http://latlong.mellifica.se/ where you type lat long coordinates (in the Grad/min/sek field with space) or directly as a link, e.g. http://latlong.mellifica.se/?latlong=59.326617,18.071697

Measurement data, task 1

In the matlabfile Assign3a.mat you get positions (in SWEREF99 coordinates, 1 m resolution) where the signal strength measurement is taken and the position for the current base station together with the RSSI value and the CellID.

Npos, Epos: North and East coordinates for the measurement

Nbase, Ebase: North and East coordinates for the current base station

RSSI: Received signal strength in dBm

CellID: Current Base station identity

Measurement data, task 2:

The reported RSSI values are given in the table below together with base station coordinates

Base station	RSSI	Cellid	Cell lat	Cell long	N	E
C0	-73 dBm	5754	55.710226	13.214211	6176968.001	226321.768
C1	-71 dBm	6369	55.708407	13.237082	6176790.908	227762.905
C2	-83 dBm	956	55.698757	13.218047	6175695.418	226585.302
C3	-75 dBm	778	55.721416	13.245211	6178248.307	228247.854
C4	-83 dBm	794	55.7058	13.1924	6176451.474	224959.338

Assume that all base stations transmit with the same power. Where is the measurement taken? Hint: use the propagation exponent and reference level from task 1.

Assignment submission

Submit your assignment no later than on March 5 to the e-mail adress given in an email. Your submission should include the following:

- A technical document, where you discuss and adress your findings and present your results using different figures and by giving different experimental parameters estimates that you have derived.
- Your code as an appendix in the same document. This should be added as an appendix in the technical document that you provide. Do not submit m-files separately.

Name your report WCC3_Lastname1_Lastname2.pdf, where Lastname1 is the family name of the first project partner and Lastname2 is the family name of the (possible) second project partner