EITN85 - Wireless Communication Channels
Assignment 3

Course Lecture: Meifang Zhu
Handed Out: Feb 21th, 2022
Due data and Time: March 7th, 2022, 5pm

Aim

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	-65 dBm	10411	55.709573	13.208098	6175211	387413
C1	-83 dBm	15031	55.699144	13.213829	6174038	387743
C2	-71 dBm	10412	55.711667	13.203889	6175451	387154
C3	-89 dBm	4009	55.716593	13.203416	6176000	387039
C4	-91 dBm	45280	55.705748	13.202450	6174795	387047
C5	-71 dBm	4066	55.709839	13.211068	6175236	387600

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 address given in an email. Your submission should include the following:

- A technical document, where you discuss and address your findings and present your results using different figures and by giving different experimental parameters estimates that you have derived.

- Include plots of your results. Those plots should be nice and clear with labels on the axes and decent units. Include also a map with your estimates.
- 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.

Submit your complete assignment as a pdf-file to meifang.zhu@eit.lth.se. Name your file EITN085-ASSIGN1-Lastname1-Lastname2.pdf, where you replace “Lastname1” and “Lastname2” with your own last names. The subject of your e-mail should be EITN085- ASSIGN1-Lastname1-Lastname2