

Professor Name: Dr. Ridha Ouni

Project Title: *Localization and tracking using Bluetooth-based mobile devices.*

No. of Students: 2 or 3

Prerequisites: CEN444, programming (Matlab)

Abstract:

Recently, tracking and some other applications are needed inside buildings or small houses in suburban areas, with sizes ranging from a few meters to tens of meters. These environments dramatically influence the wireless propagation channel, the signal quality and the application performances.

Three levels in the received signal variation rate are identified as function of the distance between the access points (AP) and MS; namely, very slow variations due to the range, slow or long-term variations due to shadowing and fast or short-term variations due to multipath.

Moreover in an indoor environment, the corner effects are very seldom studied. It causes dropping off the received signal strength (RSS) at the MS by 20dB or more in few meters when turning a corner. Therefore, several characteristics of the communication environment should be considered while designing localization and/or tracking applications.

Localization techniques. Position estimation using Time of Arrival (ToA), Time Difference of Arrival (TDoA), and Angle of Arrival (AoA) measurements are the commonly used location techniques. These techniques, using location parameters received from different sources, are based on intersections of circles, hyperbolas, and lines, respectively. In addition, Triangular Convergence Location (TCL) technique is a geometric localization model used in cellular networks.

Required equipment and/or SW:

Matlab,

Phase 1: The work to be completed in CEN492

The first step consists of :

- Studying Bluetooth technology,
- Studying microcells environment,
- Discovering the related works achieved for localization and tracking,
- Proposing a suitable localization & tracking technique for short range environment.

Phase 2: The work to be completed in CEN493

To overcome various limitations of localization techniques, new model (proposed in phase 1) in order to simplify intensive and recursive computing of the localization process. It is useful to deploy a suitable implementation environment for acting on the execution time, cost, and therefore power consumption. In the phase 2, the students are requested to:

- Use Matlab as implementation environment,
- Design and implement of the proposed localization & tracking technique,
- Perform some experiments for wireless and mobile devices (fixed topology, dynamic topology),
- Analyze result and write report.