Positioning in Indoor Environments using WLAN Received Signal Strength Fingerprints

Christos Laoudias
ECE Department, KIOS Research Center, University of Cyprus

Abstract:

The massive availability of mobile devices combined with the fact that people tend to spend most of their time in indoor environments, such as shopping malls, libraries, university campuses etc, has revitalized the interest in indoor location-aware applications, including in-building guidance, asset tracking, event detection and autonomous robot navigation. Although satellite-based positioning, e.g. Global Positioning System (GPS), achieves high level of accuracy outdoors, it is not applicable in urban canyons or inside buildings due to the severe attenuation or blockage of satellite signals. This has motivated the development of indoor positioning methods that rely on wireless network infrastructure.

The provision of accurate and reliable location estimates is challenging especially in indoor environments, where the signal propagation is complex due to the presence of non-line-of-sight (NLOS) paths between the receiver and the transmitter and the prevalence of multipath conditions. Fingerprint positioning methods address this issue by using fingerprints collected a priori in the entire area of interest. These fingerprints contain location related information, e.g. angle, timing or signal strength samples, and are associated with a set of predefined reference locations. Location can then be estimated by finding the best match between the observed fingerprint during positioning and the reference fingerprints.

This talk will provide the background on indoor positioning and an overview of existing solutions, including different technologies, types of measurements and algorithms. Fingerprint methods that rely on WLANs and exploit Received Signal Strength (RSS) measurements to infer location will be described in more detail. We will present our work on the use of Radial Basis Function networks to determine location and on the adaptation of the Subtract on Negative Add on Positive (SNAP) positioning algorithm to the WLAN setup, followed by a discussion on the open research issues in this area.

Biography:

Christos Laoudias received the Diploma on Computer Engineering and Informatics and M.Sc. on Integrated Hardware and Software Systems from the University of Patras, Greece in 2003 and 2005, respectively. He joined the Department of Electrical and Computer Engineering, University of Cyprus in January 2006 as a research assistant working in the area of location-aware applications and positioning platforms. He is a Ph.D candidate in Computer Engineering at the University of Cyprus and a graduate researcher at KIOS Research Center for Intelligent Systems and Networks. His research interests revolve around Wireless Networks, Mobile Communications, Location-Based Services, Positioning and Tracking Technologies and Fault Tolerant Location Estimation. His research has been partially funded by the Cyprus Research Promotion Foundation.