Overview of Outdoor and Indoor Positioning Technologies and Systems

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

Abstract:

Where am I? What is my orientation? How do I move or navigate? How do I reach a place? These are all fundamental questions that arise when location is unknown; either if you are a soldier air dropped behind the enemy lines or a traveler sightseeing around the city center. Satellite based positioning, e.g. Global Positioning System (GPS), achieves high level of accuracy outdoors, however it is not applicable in urban canyons or inside buildings due to the severe attenuation or blockage of satellite signals. Moreover, 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, airports, museums, etc., has increased the demand for indoor location-aware applications, including in-building guidance, visitor navigation, asset tracking and event detection. These facts have triggered intense research over the last 15 years on indoor positioning methods that rely on a wide variety of technologies.

This talk will provide the background on positioning technologies and an overview of existing systems. We start out with solutions that are applicable outdoors, including satellite and cellular based systems. Then, we will present diverse technologies to determine location in indoor environments where positioning is very challenging due to the complex signal propagation conditions. In the following, we focus on indoor systems that rely on the ubiquitous WiFi infrastructure already available inside buildings and elaborate on methods that exploit signal strength measurements, which can be easily collected with commercial WiFi-equipped mobile devices, such as smartphones and tablets. Finally, we move from theory to practice and present our Airplace positioning platform developed on Android smartphones.

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. His interests revolve around Wireless Networks, Mobile Communications, Location-Based Services, Positioning and Tracking Technologies and Fault Tolerant Location Estimation. His research has been funded by the Cyprus Research Promotion Foundation. He is student member of IEEE and serves as a spokesman of the Association of Ph.D. Candidates of Cyprus.