

Localization in WiMAX Networks

Mussa Bshara
Vrije Universiteit Brussel
ELEC Department



Vrije Universiteit Brussel

Classification of localization Systems/Architectures

Classification 1:

- **Indoor** (e.g. WLAN)
- **Outdoor** (e.g. GPS, Wireless network-aided)

Classification 2:

- **Wireless network-aided**
- **Sensor network-aided**
- **GPS**
- **AGPS**
- **Combination between GPS and wireless network-aided**

GPS and Wireless network-aided

GPS	Wireless network-aided
Devices have to be GPS enabled (high unit price)	No extra hardware is required
High power consumption	No extra power consumption
Long acquisition times	No acquisition time
Has to be synchronous	Synchronous or asynchronous

Positioning in Cellular Networks application areas

- FCC (Federal Communications Commission) which requires that the precise location of all enhanced 911
- European Recommendation E112

- Both E911 and E112 require that wireless providers should be able to locate within tens of meters users of emergency calls.

- Location-based Services including:
 - Navigation
 - Network optimization
 - Resource allocation
 - Automatic billing
 - Ubiquitous computing
 - location-aware computing

Localization Algorithms in wireless networks

- Time-Of-Arrival (TOA) based algorithms (Timing advance in GSM, timing adjust in WiMAX)
- Time-Difference-Of-Arrival (TDOA) based algorithms.
- Angle-of-Arrival (AoA) based algorithms, *also known as Direction-of-Arrival (DoA) based algorithms*
- Received Signal Strength (RSS) based algorithms.

Session presentations

Presentations will address localization in GSM, WIFI and WiMAX networks as follows:

1- On GSM-positioning, from measurement to algorithm:

In this paper, the authors consider all practical issues related to realizing terminal-based cellular positioning, from measurement to positioning algorithm

2- Indooria - A Platform for Proactive Indoor Location-based Services

In this paper, the authors consider the problem of positioning mobile terminals, persons and assets inside buildings and provide a new approach for future indoor LBS

3- Automatic Calibration of Large-scale WiFi-Positioning Systems

In this paper, the authors consider the problem of outdoor WiFi positioning systems and present an approach for the automatic calibration of these systems assisted by another reference positioning system

4- Localization in WiMAX Networks Based on Signal Strength Observations

In this paper, the authors consider the problem of positioning in WiMAX networks depending on RSS observations. Applications in Location-based Services