



Improved Mobile User Localization

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WARF: P140393US01

Inventors: Akbar Sayeed

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new method for calculating the location of wireless devices using channel signature data.

Overview

The rapid proliferation of wireless devices has caused a surge in data rates. Higher frequencies including millimeter wave frequencies (30-300 GHz) are being explored to address the spectrum crunch.

At such high frequencies, channel signatures become richer and more informative. This presents new opportunities as well as challenges when trying to determine the location of a smartphone or other mobile device – a process called localization.

Existing techniques use information provided by a signal's line-of-sight (LoS) path (including angle of arrival, time difference of arrival or received signal strength) to triangulate the user's location from two base stations. A major drawback to this technique is that LoS propagation is not always guaranteed in a real-world environment filled with obstacles and scatter.

The Invention

A UW-Madison researcher has developed a localization method using sparse angle-delay channel signatures. The new method exploits both LoS and non-LoS propagation paths for improved performance.

Using measured channel signatures, a statistical pattern classifier is designed to determine a device's location from the signals that it sends to the base station. Pattern matching is performed on the signal received at the base station using a database of statistical classifier information, and finally a location is computed. The database is based on various 'cells' or 'regions' that are used to decrease complexity during the pattern matching.

Applications

- Software processed at base stations or on cloud-based platforms
- Pertains to any device communication with a base station (e.g., wireless electronics, 'smart' cars, etc.)
- Can work with researcher's CAP MIMO antenna technologies

Key Benefits

- More accurate localization
- Relies on a single base station (versus triangulation); could also be used with multiple base stations
- Cuts computational complexity

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Stage of Development

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The researcher has simulated and modeled the method using sparse high-dimensional MIMO channels at 30 GHz.

Additional Information

Related Technologies

- [WARF reference number P110040US01 describes the researcher's continuous aperture phased MIMO \(CAP MIMO\) system for enhanced wireless communications.](#)

Tech Fields

- [Information Technology : Networking & telecommunications](#)

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846

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