mmWave Indoor Localization Platform for 5G/6G and IoT Networks



Background

Indoor localization has become a critical enabling technology for the Internet of Things (IoT), supporting applications such as smart healthcare, asset tracking, autonomous robotics, industrial automation, and smart building management. As IoT deployments increasingly move indoors where GPS is unavailable or unreliable, demand continues to grow for accurate, reliable, and real-time positioning capabilities. Modern IoT environments require localization solutions that are scalable, energy-efficient, and seamlessly integrated with existing wireless infrastructure and emerging 5G/6G networks.

Description of the Invention

This technology is a model-driven indoor localization framework that determines the two-dimensional position of a wireless device using millimeter-wave (mmWave) radio signals received by distributed antenna arrays. The framework combines a modular antenna infrastructure, a two-stage signal-processing approach for identifying line-of-sight paths in multipath environments, and a closed-form geometric localization engine that estimates device location from measurements collected across multiple antenna arrays. The system operates without requiring time synchronization, offline calibration, or environment-specific training data and is designed for integration with existing and emerging wireless communication networks.

Key Benefits

- Robust in reflective, multipath-rich environments
- Real-time tracking and positioning, sub-centimeter precision
- No calibration or synchronization required
- Low-cost deployment using existing mmWave infrastructure
- Scalable distributed architecture
- Supports High-Density IoT Deployments in crowded indoor environments
- Facilitate Dual-use infrastructure for connectivity and localization

Applications

- **Telecom & Network Equipment** – Built-in indoor localization for 5G/6G and mmWave networks.
- **Autonomous Robotics** – Precise indoor positioning for navigation, fleet management, and collision avoidance.
- **Industrial Automation & Logistics** – Asset, inventory, and workforce tracking for Industry 4.0 and digital twins.
- **Healthcare & Assisted Living** – Real-time tracking of patients, staff, and medical assets.

Publications: https://ieeexplore.ieee.org/document/11754996

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Stage of Development:
Concept
Validation through simulations

Seeking:
Development Partners
Licensees

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