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Joint TOA and DOA Acquisition and Tracking Approach for Positioning with LTE Signals

Tech ID: 34526 / UC Case 2020-627-0

BRIEF DESCRIPTION

A novel LTE-based navigation system that enhances positioning accuracy and reliability by jointly estimating time-of-arrival (TOA) and direction-of-arrival (DOA) of signals.

FULL DESCRIPTION

This technology uses existing cell tower LTE signals for vehicle navigation instead of relying solely on GPS. It combines a specialized algorithm called the 3D matrix pencil (MP) algorithm with smart tracking to measure both signal timing and direction, achieving accuracy within 1-3 meters even in difficult city environments with tall buildings. The system works without needing to know the vehicle's starting position and uses advanced signal processing to maintain reliable performance despite interference and signal obstacles.

SUGGESTED USES

- » Autonomous vehicles and mobile devices: Provides reliable navigation for self-driving cars, drones, and smartphones.
- » Smart transportation and logistics: Enables accurate tracking for delivery systems, fleet management, and supply chain operations.
- » Emergency and critical operations: Offers backup navigation for military missions, first responders, and telecom networks.

ADVANTAGES

- » Enhanced location tracking: Combines multiple signal measurements from cell towers to pinpoint position more accurately.
- » Works where GPS fails: Reliable in areas like downtown city centers with tall buildings where GPS signals are blocked or weak.
- » More efficient: Uses less processing power while providing more stable results, and doesn't require precise timing between cell towers

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,729,583	08/15/2023	2020-627

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OTHER INFORMATION

CATEGORIZED AS

- » **Communications**
 - » Wireless
- » **Sensors & Instrumentation**
 - » Position sensors
- » **Transportation**
 - » Aerospace
 - » Automotive

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