Navigation With Starlink Satellite Signals

Tech ID: 34259 / UC Case 2021-957-0

BRIEF DESCRIPTION

A novel method to extract navigation observables from Starlink LEO satellite signals enabling precise positioning without additional infrastructure.

FULL DESCRIPTION

This technology leverages Starlink broadband satellite signals as opportunistic sources for navigation. It introduces a method to extract carrier phase and Doppler observables from these signals, despite the unknown signal structure and high dynamics of low Earth orbit (LEO) satellites. This approach enables navigation in scenarios with strict size, weight, and power constraints, without requiring cooperation from broadband providers.

SUGGESTED USES

- Mobile device manufacturers for enhanced location services.
- Cellular network providers to improve network-based positioning.
- Unmanned aerial vehicle (UAV) manufacturers for precise autonomous navigation.
- Automotive industry for advanced driver assistance and autonomous driving.
- Aerospace and defense contractors for secure and accurate positioning.
- Global Navigation Satellite Systems (GNSS) equipment manufacturers to complement existing satellite navigation systems.

ADVANTAGES

- Enables navigation using Starlink LEO satellite signals without prior knowledge of signal structure.
- Achieves high positioning accuracy with horizontal errors as low as 7.7 meters.
- Operates opportunistically without requiring modifications or cooperation from broadband providers.
- Supports simultaneous tracking of multiple satellites to enhance spatial and spectral diversity.
- Suitable for size, weight, and power constrained autonomous systems.
- Faster and more accurate than existing blind signal processing algorithms.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	2024029155	08/29/2024	2021-957

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OTHER INFORMATION

KEYWORDS

Positioning, Signals of Opportunity, Low Earth Orbit (LEO) Satellites, Autonomous Vehicles

CATEGORIZED AS

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

RELATED CASES

2021-957-0

RELATED MATERIALS

- Neinavaie, M., Khalife, J., Kassas, Z. M. (2022). Acquisition, Doppler tracking, and positioning with Starlink LEO satellites: first results. T-AES, 58 (3). - 11/11/2021
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