Opportunistic Navigation With 5G Signals

Tech ID: 34255 / UC Case 2020-643-0

BRIEF DESCRIPTION

This technology enables precise navigation by opportunistically using 5G new radio (NR) signals without requiring dedicated positioning transmissions or direct network communication.

FULL DESCRIPTION

This technology leverages broadcasted 5G NR reference signals to provide accurate positioning and navigation for autonomous ground vehicles and other applications. Unlike traditional methods requiring dedicated positioning signals and prior system knowledge, this approach extracts navigation observables from existing 5G signals using a software-defined receiver. It demonstrates meter-level range estimation accuracy with real-world 5G signals, enhances situational awareness for reliable autonomy, and supports applications in vehicle-to-everything (V2X) communication.

SUGGESTED USES

- Autonomous ground vehicles and self-driving cars.
- Mobile device manufacturers for enhanced location services.
- Cellular network providers deploying 5G infrastructure.
- Unmanned aerial vehicles (UAVs) and drone navigation.
- Aerospace and defense navigation systems.
- First responder location tracking and emergency services.

ADVANTAGES

- Utilizes existing 5G broadcast signals without additional bandwidth allocation.
- Does not require prior knowledge of network parameters or direct network communication.
- Provides meter-level accurate range estimation demonstrated with real 5G signals.
- Supports enhanced situational awareness critical for autonomous vehicle reliability.
- Enables privacy-preserving navigation by avoiding network-based positioning.
- Compatible with modern 5G infrastructure and future cellular networks.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,401,558	08/26/2025	2020-643

CONTACT

Ben Chu
ben.chu@uci.edu
tel: .



OTHER INFORMATION

KEYWORDS

Positioning, Software-Defined Receiver, Autonomous Vehicle Navigation, Wireless Communication

CATEGORIZED AS

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

RELATED CASES

RELATED MATERIALS

» Shamaei, K., Kassas, Z. M. (2021). Receiver design and time of arrival estimation for opportunistic localization with 5G signals. IEEE TWC, 20 (7). - 03/03/2021

» Abdallah, A. A., Shamaei, K., Kassas, Z. M. (2020). Assessing real 5G signals for opportunistic navigation. ION GNSS+. - 09/21/2020

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Applied Innovation

5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683

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