Accurate and Secure Navigation for Autonomous Vehicles

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BACKGROUND

Navigational systems of autonomous vehicles, integrate positioning signals from a variety of sources, each of which may have certain limitations. Inertial navigation systems (INS) are prone to accumulated uncertainty errors when operating alone but are often paired with other systems. Added sensors such as cameras, lasers, and sonar may be too large or expensive in some cases. Global positioning system (GPS) signals can be lost in dense urban environments or altered by a malicious attack, so other sensor-less and GPS-independent signals are needed to ensure and improve autonomous navigation.

BRIEF DESCRIPTION

While cellular phone networks are not designed for navigation, they are abundant in urban environments which are known to challenge GPS signals. University of California, Riverside researchers integrated signals-of-opportunity from mobile phone networks to provide autonomous vehicles with precise navigational information.

ADVANTAGES

- **Low cost & lightweight** – uses cellular phone signals instead of bulky sensors or cameras
- **Accurate** – real-time vehicle demonstrations achieved positioning estimation with reliable sub-meter level accuracy

APPLICATIONS

- **Autonomous/manned vehicles** – aerial, terrestrial, naval
- **Navigational and positional systems** – e.g. telematics/remote, smartphones, wearables, location-based services, surveillance, mapping, precision localization

RELATED MATERIALS

- J. Khalife, Z. Kassas “Precise UAV navigation with cellular carrier phase measurements” 2018 IEEE/ION PLANS, DOI: 10.1109/PLANS.2018.8373476 - 04/23/2018

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,366,236	06/21/2022	2017-484

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OTHER INFORMATION

KEYWORDS

signals of opportunity, opportunistic navigation, precision localization, navigation, autonomous vehicles

CATEGORIZED AS

- **Transportation**
  - Automotive
  - Other
- **Engineering**
  - Robotics and Automation

RELATED CASES

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