Sub-Meter Accurate Navigation And Cycle Slip Detection With Long-Term Evolution (LTE) Carrier Phase Measurements

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BRIEF DESCRIPTION

A novel navigation framework leveraging LTE cellular signals enables sub-meter level accurate UAV positioning in GNSS-challenged environments.

FULL DESCRIPTION

This technology utilizes long-term evolution (LTE) carrier phase measurements to achieve sub-meter-level accurate unmanned aerial device (UAV) navigation. It overcomes limitations of Global Navigation Satellite System (GNSS) in urban canyons and interference-prone areas. Experimental results demonstrate an 81 cm two-dimensional positioning accuracy over a 605 m UAV trajectory, offering a reliable alternative or complement to GNSS for UAV navigation.

SUGGESTED USES

- Unmanned aerial vehicle navigation for package delivery and traffic monitoring in urban areas.
- Military and defense UAV operations requiring secure and reliable positioning.
- Agriculture, construction, mining, mapping, and surveying using UAVs in GNSS-challenged terrains.
- Integration with automotive and aerospace navigation systems for enhanced location accuracy.
- First responders and emergency services deploying UAVs in complex environments.

ADVANTAGES

- Provides sub-meter level positioning accuracy in environments where GNSS signals are weak or unreliable.
- Robust against jamming and spoofing attacks common in GNSS systems due to LTE signal diversity and power.
- Utilizes existing cellular infrastructure without requiring additional hardware deployment.
- Innovative cycle slip detection enhances measurement reliability and navigation accuracy.
- Fuses multiple LTE signal measurements to improve UAV position and velocity estimates in real time.

PATENT STATUS

Country	Type	Number	Dated	Case

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OTHER INFORMATION

KEYWORDS

Navigation, Precise Positioning, Unmanned Aerial Vehicles (UAVs), Signal of Opportunity, Long-Term Evolution (LTE)

CATEGORIZED AS

- **Communications**
  - Wireless
- **Security and Defense**
  - Other
- **Sensors & Instrumentation**
  - Position sensors
- **Transportation**
  - Aerospace
  - Automotive

United States Of America	Issued Patent	11,921,522	03/05/2024	2020-606

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