# Computationally Efficient Real-Time Positioning/Navigation with Centimeter Accuracy

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## OTHER INFORMATION

### KEYWORDS

mobile, autonomous vehicle, global positioning system, GPS, INS, inertial navigation system / measurement unit, precision, location, IMU, navigation, integer ambiguity resolution

### CATEGORIZED AS

- **Communications**
  - Internet
  - Wireless
- **Computer**
  - Other
- **Engineering**
  - Engineering
  - Other

### RELATED CASES

2016-019-0

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| United States Of America | Issued Patent | 10,761,216 | 09/01/2020 | 2016-019 |

## IMAGES



## BRIEF DESCRIPTION

### Background:

Global positioning system (GPS) uses space-based satellites while an inertial measurement unit (IMU) use gyroscopes and accelerometers. Aided inertial navigation systems (INS) harness the strengths of both sensors to reliably measure the system position. Although aided INS can provide positioning information, the computational complexity involved in reliably obtaining high-precision has great room for improvement.

### Current Invention:

UCR researchers have developed a novel multi-epoch carrier phase integer ambiguity resolution approach combining GPS/IMU data that allows them to achieve centimeter-level global positioning accuracy for precise localization. They successfully transformed the original optimization problem into two more easily solved problems allowing computations to be reduced by several orders of magnitude. This optimization will allow for high accuracy solutions, to be achieved more reliably, with computational loads suitable for real-time applications on low power processors, such as the application processors used in mobile devices.

## ADVANTAGES

- 600-fold demonstrated computational savings – real-time implementation has been demonstrated
- Sub-decimeter position estimation more reliably achieved by the use of multi-GPS epochs and a time window of IMU data

## APPLICATIONS

- Mobile devices – e.g. smartphones, wearables, location-based services, precision localization
- Navigation system – e.g. autonomous/ manned aerial/terrestrial/naval vehicles, telematics/remot

## RELATED MATERIALS

- Computationally Efficient Carrier Integer Ambiguity Resolution in Multiepoch GPS/INS: A Common-Position-Shift Approach.

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