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Observability constrained vision-aided inertial navigation (OC-VINS)

Novel techniques for eliminating estimator inconsistency in vision-aided inertial navigation systems.

IP Status: US Patent Issued; **Application #:** 14/186,597

Applications

- Vision-aided inertial navigation systems (VINS)

Technology Overview

Researchers at the University of Minnesota have developed novel techniques for eliminating estimator inconsistency in vision-aided inertial navigation systems (VINS). A significant cause of inconsistency is due to gain of spurious information along unobservable directions, resulting in smaller uncertainties, larger estimation errors, and divergence. The novel Observability-Constrained VINS (OC-VINS) discussed here may enforce the unobservable directions of the system, thereby preventing unobservable directions from erroneously being treated as observable after estimation. This in turn, prevents spurious information gain and reduces inconsistency. In addition, this technology presents a linear-complexity 3D inertial navigation algorithm that computes state estimates based on a variety of captured features, such as points, lines, planes or geometric shapes based on combinations thereof, such as crosses (i.e., perpendicular, intersecting line segments), sets of parallel line segments.

This OC-VINS technology is applicable to several variants of VINS, such as Visual Simultaneous Localization and Mapping (V-SLAM) as well as visual-inertial odometry using the Multi-state Constraint Kalman Filter (MSC-KF), or an inverse filter operating on a subset of or all image and IMU data.

Phase of Development

TRL: 5-6
This technology for reducing inconsistency is extensively validated with simulation trials and real-world experimentation.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

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Category
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