Prioritizable IMU Array (Prio-IMU) for Enhanced Pedestrian Navigation

Tech ID: 33682 / UC Case 2023-807-0

BRIEF DESCRIPTION

This technology introduces a novel, cost-effective solution for improving the accuracy of pedestrian navigation systems under extreme conditions.

FULL DESCRIPTION

Researchers at UC Irvine have developed a wearable technology based on biomechanics of human locomotion for precise localization and navigation indoor and in covered outdoor environment, where the environment is not known and where GPS signals are not available. The technology is based on a method that precisely and adaptively detects the stance phase in human gait cycles and hardware Prio-IMU, a technology that is using an array of inertial measurement units (IMUs) with varying sensor full-scale ranges (FSRs) and noise characteristics to overcome the limitations of conventional foot-mounted inertial navigation systems (INS). By combining IMUs with learning algorithms, the navigation systems maintains high accuracy during challenging activities like running, jumping, and crawling, addressing limitations of traditional navigation systems.

SUGGESTED USES

- Enhanced pedestrian navigation systems for emergency responders and military personnel in GPS-denied environments.
- Advanced clinical gait analysis by accurately measuring extreme inertial forces experienced by the foot during motion.
- Consumer-grade fitness and health tracking devices requiring accurate activity recognition and analysis.

ADVANTAGES

- Enables accurate pedestrian navigation during a wide range of activities, including non-walking movements, such as running, jumping, crawling.
- Direct measurement of large inertial forces generated by foot motion, improving navigation accuracy.
- Cost-effective solution, significantly cheaper than high-performance COTS IMUs with comparable specifications.
- Reduces the dependency on algorithmic compensation for sensor limitations, offering a more robust solution.

PATENT STATUS

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

- **Sensors & Instrumentation**
  - Position sensors

RELATED CASES

2023-807-0, 2020-681-0

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,215,975	02/04/2025	2020-681
United States Of America	Published Application	20250164249	05/22/2025	2023-807
United States Of America	Published Application	20250164250	05/22/2025	2023-807

Additional Patent Pending

STATE OF DEVELOPMENT

Prototype developed

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Micromachined Gyroscope Design Allowing for Both Robust Wide-Bandwidth and Precision Mode-Matched Operation
- 3-D Folded MEMS Technology For Multi-Axis Sensor Systems
- Micro-glassblowing for Gyroscope Fabrication

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