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High-Precision Vehicle Navigation using Kalman Filter Algorithm

Technology No. z07191

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High-Precision Vehicle Navigation System is a GPS Alternative

A highly precise navigation system uses visual-aided inertial navigation measurements that feeds into a unique Kalman filter based algorithm for pose estimation (position and orientation). The pose estimation algorithm can provide a unified basis for stability control, traction control, slip detection and obstacle avoidance in ground-based applications and navigation and tracking in air-based applications. The system is a GPS alternative and can operate where GPS and odometry systems fail or are denied. It can be integrated into existing automatic active safety systems and aerospace navigation systems.

Kalman Filter Based Algorithm

Inexpensive inertial and image sensors feed into a Kalman filter-based algorithm and enable a low-cost inrtial navigation system that has applications as a backup navigation system or as a primary navigation system. The computational requirements are significantly less than the state-of-the-art simultaneous localization and mapping technology (SLAM) and enable computational low-cost, real-time performance. The system provides real-time vehicle position, attitude, velocity and acceleration using image and inertial sensors.

FEATURES AND BENEFITS OF VISUAL-AIDED INERTIAL NAVIGATION:

- Combines vision and inertial sensing (similar to human perception)
- Kalman filter-based algorithm generates pose estimation (position and orientation) information, which enables faster and more robust tracking
- High accuracy and low computational complexity in highly cluttered ?real-world? environments
- Higher accuracy and lower cost than radar-based systems
- Operates where GPS/odometry systems may fail

- Can be integrated in existing automotive active safety systems or unmanned aerial vehicle navigation systems

Phase of Development Algorithm validated in both automotive and aerospace experiments.

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