



# High-Precision Vehicle Navigation using Kalman Filter Algorithm

**IP Status:** Issued US Patent; **Application #:** 12/383,371

## 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 inertial 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.

**Researchers:** Anastasios Mourikis, PhD Associate Professor, Department of Engineering, University of California Riverside,

## Technology ID

z07191

## Category

Engineering & Physical Sciences/Instrumentation, Sensors & Controls  
Engineering & Physical Sciences/Robotics  
Engineering & Physical Sciences/Transportation  
Software & IT/Algorithms  
Software & IT/Image & Signal Processing  
Software & IT/Simulation & Modeling  
Software & IT/Transportation

## Learn more

