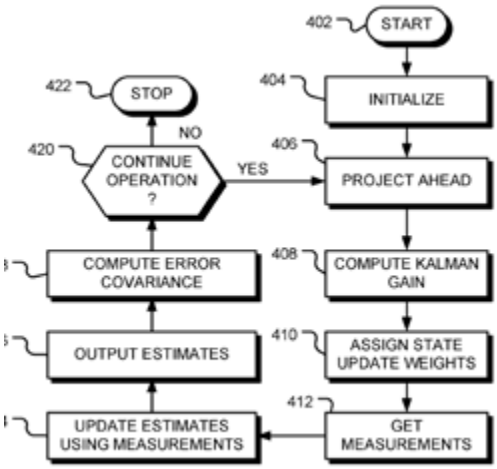
DOOLITTLEINSTITUTE
speed-innovation-solutions

Estimating and updating the impact of weighted variables in physical systems

Iterative fixed- or time-varying updates provide more accurate, consistent, and flexible estimates than before

Autonomous and semiautonomous physical systems, such as aircraft and vehicles, optimize their trajectories by estimating unknown variables over time through different types of Kalman filters. Although many are adequate for some applications, current filters include linearization errors and noise which impact performance, and improvements to current filters cannot accommodate gradual uncertainty growth. Sometimes it is necessary to estimate the noise itself. A flow chart describing the iterative sensing, estimating, predicting, and decision-making for a physical system described herein. Researchers at the Air Force Research Laboratory Munitions Directorate (AFRL/RW) have addressed these problems with a new invention, the Partial-update Schmidt-Kalman filter (PSKF). This new method and apparatus estimates states of a physical system--linear or non-linear--through an iterative process. Predicted states and actual sensor data are combined to estimate a new predicted state. The gain matrix is likewise updated based on the state update weights, providing a user with significantly more flexibility. Further, a user can more easily "tune" the filter than in existing Unscented Kalman filters. This new approach may be implemented in discrete or continuous systems using a weighted sum of initial updates and prior estimates, thus minimizing mean square error. This solution can be executed on commercially available, general-purpose computers and flash drives using common programming languages such as C and C++. Because of its accessibility, applications for the PSKF are robust and include robotics systems, image processing systems, vehicles, industrial processes, biological systems, and information systems.



A flow chart describing the iterative sensing, estimating, predicting, and decision-making for a physical system described herein.

BENEFITS

Expands the degree of uncertainty the estimator can accommodate

Excels in non-linear systems; Weighting can be fixed or time-varying

Increased flexibility produces more accurate and consistent state updates

Significantly outperforms other filters such as SKF, EKF, and UKF

OPPORTUNITIES

US patent 10,969,752 available for license

Collaboration with Air Force researchers

Potential for:
Autonomous Vehicles
Aerospace
Robotics
Automation

READY TO COLLABORATE?

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