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*Factor Graph Optimization for GNSS/INS Integration:
A Comparison with the Extended Kalman Filter*

By Weisong Wen, Tim Pfeifer, Xiwei Bai and Li-Ta Hsu

Factor Graph Optimization for GNSS/INS Integration: A Comparison with the Extended Kalman Filter was published in the Summer 2021 issue of NAVIGATION, Journal of the Institute of Navigation, Volume 68, No. 2, pp. 315-331.

Factor graph optimization (FGO) recently has attracted attention as an alternative to the extended Kalman filter (EKF) for GNSS-INS integration. This study evaluates both loosely and tightly coupled integrations of GNSS code pseudorange and INS measurements for real-time positioning, using both conventional EKF and FGO with a dataset collected in an urban canyon in Hong Kong. The FGO strength is analyzed by degenerating the FGO-based estimator into an “EKF-like estimator.” In addition, the effects of window size on FGO performance are evaluated by considering both the GNSS pseudorange error models and environmental conditions. We conclude that the conventional FGO outperforms the EKF because of the following two factors: (1) FGO uses multiple iterations during the estimation to achieve a robust estimation; and (2) FGO better explores the time correlation between the measurements and states, based on a batch of historical data, when the measurements do not follow the Gaussian noise assumption.

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