

## Relative Navigation with Laser-Based Intermittent Measurement for Formation Flying Satellites

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**Abstract :** This study presents a precise relative navigational method for satellites flying in formation using laser-based intermittent measurement data. The measurement data for the relative navigation between two satellites consist of a relative distance measured by a laser instrument and relative attitude angles measured by attitude determination. The relative navigation solutions are estimated by both the Extended Kalman filter (EKF) and unscented Kalman filter (UKF). The solutions estimated by the EKF may become inaccurate or even diverge as measurement outage time gets longer because the EKF utilizes a linearization approach. However, this study shows that the UKF with the appropriate scaling parameters provides a stable and accurate relative navigation solutions despite the long measurement outage time and large initial error as compared to the relative navigation solutions of the EKF. Various navigation results have been analyzed by adjusting the scaling parameters of the UKF.

**Keywords :** satellite relative navigation, laser-based measurement, intermittent measurement, unscented Kalman filter

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