

## **Multiple-Model Adaptive Estimation of Time-Varying Residual Magnetic Moment for Small Satellites**

As the satellite size gets smaller, the residual magnetic moment (RMM) becomes the dominant attitude disturbance for the low Earth orbit satellites. Especially for advanced space missions such as astronomical observation, the RMM must be in-orbit estimated and compensated to increase the attitude pointing accuracy. Classical estimators can estimate the RMM terms accurately as long as the terms are constant. However, if there are unmodeled changes in the RMM parameters, as experienced for small satellite missions, then the estimations may deteriorate for a long time until the estimator catch the new values. In such cases the designer must sacrifice either the accuracy or the tracking capability of the estimator. In this paper, we propose a Multiple-Model Adaptive Estimation (MMAE) technique for the RMM estimation. By the use of a newly defined likelihood function both the steady state accuracy and tracking agility are secured for the estimator.