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Author: Dr. Gwanghyeok Ju
Korea Aerospace Research Institute (KARI), Korea, Republic of

Dr. Keunjoo PARK
Korea Aerospace Research Institute (KARI), Korea, Democratic People's Republic of
Dr. Sang-Ryool Lee
Korea Aerospace Research Institute (KARI), Korea, Republic of

PRELIMINARY ANALYSIS ON ATTITUDE DETERMINATION ACCURACY FOR NEXT-GENERATION KOREAN MULTI-PURPOSE GEOSTATIONARY SATELLITE

Abstract

A new plan for the next-generation Korean multi-purspose geostationary satellite (thereafter, COMS-2) is being established as a successor of the COMS (Communication, Ocean and Meteorological Satellite) developed by KARI (Korea Aerospace Research Institute), which is a first hybrid geo-stationary satellite in Korea and is scheduled to be launched in late 2009.

While the COMS accommodates multiple payloads of MI(Meteorological Imager), GOCI(Geostationary Ocean Color Imager), and the K-band Communication Payload into a single spacecraft platform in order to provide Korea with the following services for the mission lifetime of at least 7 years: meteorological service, ocean monitoring, and satellite communication, new combinations of payload candidates including ABI (Advanced Baseline Imager) are under consideration for the new GEO satellite.

The ABI is originally designed to accommodate GOES-R mission for next-generation meteorological service in the United States. Since its performance has more than doubled in terms of pixel resolution, image navigation accuracy, timeliness conditions for image delivery to end-users, a detailed analysis is needed to investigate whether a new payload such as ABI is feasible to the current design of COMS before the payload is adopted.

In order to meet the requirements of highly leveled-up geometric image quality for the ABI, the COMS-2 system will definitely have the INR (Image Navigation System and Registration) system whose goal is to determine the location of any pixel within an image in terms of Earth longitude and latitude, and to maintain absolute and mutual longitude and latitude spatial relationships within and among images. In parallel, tight performance requirements are required in terms of attitude determination accuracy and stability.

In this paper, a summary of the basic simulation parameters and results of a preliminary attitude determination accuracy analysis for the COMS-2 is shown by adopting the simualtion model for the gyro, the star tracker, and star sensing function inside ABI.

The study for COMS-2 involves the simulation of minor modifications to the current spacecraft heritage, so that the relative performance of these modifications can be analyzed. In addition, the effect of major sensor modification is anlayzed by placing star trackers which are added to provide precise attitude knowledge.

This preliminary attitude determination accuracy analysis includes simulation results with and without the addition of star trackers and/or Kalman filter, which is used for attitude deterination from the hybrization of attitude sensors.

This study also includes the issue on star tracker orientation in order to optimize overall attitude accuracy.

Conclusively, this study can provide some insight when attidue sensors or filtering algorithms are to be newly adopted on the new spacecraft due to improved performance requirements by users