Paper ID: 25068
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EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Data Management Systems (4)

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DEVELOPMENT OF A GENERIC, STANDARDIZED INR ARCHITECTURE FOR THE CURRENT AND FUTURE GEOSTATIOANARY REMOTE SENSING SATELLITES

Abstract

INR (Image Navigation and Registration) system is an essential part of geostationary remote sensing satellites for their on-board instrument payloads to maximally fulfill their expected missions and utility. It is our observation that all of the past and current INR systems for the three-axis geostationary remote sensing satellites utilized the 'a priori' least square algorithm in one way or another, except for the COMS (Communication, Ocean and Meteorological Satellite) INR system where the least square was designed and implemented rather differently, in the 'a posteriori' fashion. It is also our observation that for the INR systems of the upcoming and new-generation, geostationary weather and remote sensing satellites, incldluing GOES-R and MTG among others, there is the obvious trend of using the Kalman filter as the core algorithm, because it is essential to use a real-time and more refined processing algorithm to deal with the vast amount of imagery data from the advanced instrument payloads of the most recent and the future. In this paper, we introduce a conceivably generic INR architecture which is aimed to be a standardized INR design framework that can be used for diverse INR systems. The proposed INR architecture has been developed by taking the COMS INR system as the baseline platform, maintaining the excellent part of it, and replacing the least square algorithm with the Kalman filter algorithm in the best attainable form in our knowledge. In this process, it has been attempted to push the envelop of designing and implementing the Kalman filter into this class of application. It is believed that the proposed INR architecture can be used as a standard framework of the INR systems for both of the current and future geostationary remote sensing satellites, with the relevant adoption of modelings for the instrument payloads, related attitude sensors and the spacecraft status such as the thermo-elastic distortion. This paper overviews the background and motivation of this work and presents the proposed INR architecture. It shows the verification method of the proposed algorithms and discusses the major advancement and contribution of this work. It summarizes the key findings and insights that we obtained throughout this work, in the conclusion.