

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Technologies to Enable Space Systems (3)

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A HIGHLY INTEGRATED NAVIGATION UNIT FOR ON-ORBIT SERVICING MISSIONS

Abstract

VINAG (VISION/INS integrated Navigation Assisted by GNSS) is a highly integrated multisensor navigation unit, particularly conceived for On-Orbit Servicing missions. The system is designed to provide all-in-one, on-board real time autonomous absolute navigation as well as pose determination of an uncooperative known object orbiting in LEO (Low Earth Orbit), GEO (GEosynchronous Orbits) and possibly in HEO (Highly Earth Orbit). The system VINAG is under development by a team of Italian companies and universities, co-financed by the Italian Space Agency. Thanks to a tight optimized integration of its subsystems, VINAG is characterized by a low power and mass total budgets and therefore it is suitable for small and very small satellites. In order to provide both 1) absolute orbit and attitude determination and 2) vision-based pose determination, the unit integrates three metrology systems: a Cameras Subsystem (a monocular camera and a Star sensor), an Inertial Measurement Unit (IMU) and a GNSS (Global Navigation Satellite System) receiver. In this paper, we introduce the complete system

architecture, the adopted algorithms and then the adopted hardware design solutions. In addition, we describe preliminary numerical simulation results obtained for different orbits from LEO to GEO carried out for the validation phase of VINAG.