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Dipartimento di Scienze e Tecnologie Aerospaziali
Sala Consiglio, 2nd Floor, Building B12
Via La Masa, 34 - Milano

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DIPARTIMENTO DI
SCIENZE E TECNOLOGIE
AEROSPAZIALI

Angles-Only Relative Navigation in Low Earth Orbit

Jean-Sébastien Ardaens

Line-of-sight navigation is a simple and inexpensive method to rendezvous with a noncooperative object in space. Relying on passive imagery, it allows for the design of light-weight and resource-saving relative navigation systems with a high technology readiness level, and is thus a key enabling technology for missions aiming at active debris removal or sample return. However, it comes at the expense of a weak observability and is strongly affected by visibility conditions. This research investigates in detail the strengths and limitations of such a means of navigation, focusing on its practical implementation. To that end, two experiments have been recently conducted to provide valuable experience in orbit: ARGON (in 2012) and AVANTI (in 2016). The former demonstrated the ability to conduct a rendezvous with a noncooperative object in a ground-in-the-loop scheme using the PRISMA formation-flying tested. During the experiment, the distance between the satellites was reduced from 30 km to 3 km. The latter, implemented on the German BIROS satellite, was more complex, facing more challenging experimental conditions and aiming at performing the rendezvous in a fully autonomous way. The resulting increased level of autonomy made it possible to reach a final intersatellite separation of only 50 m. After a description of the relative navigation systems employed to support the experiments, the presentation provides an overview of the key flight results and of the main lessons learned.

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Registration is required to participate: www.aero.polimi.it