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REMOTE SENSING FORMATION DESIGN EXPLOITING COVERAGE OVERLAP AREA PARAMETERS

Abstract

Formation flying missions devoted to Earth observation and remote sensing are often designed to perform simultaneous observation over a targeted area at the same time. Depending on the nature of the mission, the formation size and the sensor requirements, the combined coverage of each satellite varies. A parameter called Instantaneous Overlap Area (IOA) can be used to measure the combined coverage area of a formation. This parameter is defined as a measure of the coverage area serviced by all the satellites in the formation simultaneously. Hence IOA is often seen as a measure of closeness of the formation. IOA is first tackled by analyzing the coverage area of each individual satellites, which can be represented by its Instantaneous Access Area (IAA). As an example, a theoretical "formation" of 2 satellites that at a given time are at the exact same position enjoys in such a condition a IOA value that is almost equal to the IAA of each individual satellite.

Missions with requirement for high spatial resolutions and high detailed coverage can require a high-resolution sensor with extremely narrow field of view. For having continuous coverage in such missions there is often a criterion for a minimum IOA that should be available while still satisfying the mission requirements. This paper presents the IOA as a parameter to design satellite formations. The requirements for IOA can be set as a percentage of IAA of each individual satellite and based on each mission requirements values of IOA from 75

This concept will prove valuable to missions performing InSAR (Synthetic Aperture Radar interferometry) or devoted to very long baseline optical interferometry and several other long-distance formation earth observation missions. The simulations presented are referred to LEO (Low Earth Orbit) cases and oriented to assess the degradation of IOA due to the effect of both gravitational and drag perturbations: in addition, optimal mission design strategies to alleviate the performance degradation generated by the reduced IOA are considered and discussed.