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Author: Mr. Sergio Parra
Graz University of Technology (TU Graz), The Netherlands, sergio.parra.gonzalez@gmail.com

Prof. Otto Koudelka
Graz University of Technology (TU Graz), Austria, koudelka@tugraz.at
Dr. Manfred Wittig
Germany, witti005@wxs.nl
Mr. Mahhad Nayyer
Graz University of Technology (TU Graz), Pakistan, mahhad.nayyer@gmail.com

DESIGN OF AN OPTICAL SPACE-BASED INSTRUMENT FOR A SPACE DEBRIS MONITORING MISSION

Abstract

The geostationary orbit (GEO) provides a unique ability for satellites to appear as fixed point to a ground station on the Earth surface. Remote sensing and communications satellites take advantages of the orbital period, that matches the Earth's rotation, to provide a wide range of applications and services. However, the attractiveness of this region consequently raises the RSO population (Resident Space Object) mainly caused by mission-related debris, rocket bodies associated, and/or fragment caused by the collision of those objects in orbit, and consequently, posing a threat in the GEO-orbit.

Unlike the LEO orbits, where the effect of the orbital decay is contributing to remove space-debris by the atmospheric drag, GEO orbits cannot be self-maintained. The RSOs would remain in orbit hindering the operations of satellites and increasing the risk of collisions. This is a potentially dangerous situation, since the 'economic-value' of the GEO-orbit assets are tremendously high, in the order of hundreds or even thousands of billions of dollars.

Any strategy to mitigate the consequences of space debris should be substantiated firstly in the understanding of the population of RSO. Currently, the observations of RSO are mainly being performed by ground-based instruments. The detection limit of the observations from these ground-based sensors is in the several tens of centimeters.

The objective of this paper is to define the optical space-based instrument capable to observe catalogued and uncatalogued up to 10 centimeter-size RSOs in GEO. We will describe the concept, system parameters and design tradeoffs of the instrument in order to be able to detect these objects and register them in a catalogue that is constantly maintained.