

EGU2020-8973

<https://doi.org/10.5194/egusphere-egu2020-8973>

EGU General Assembly 2020

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## Space debris monitoring based on inter-continental stereoscopic detections

**Alessandro Sozza**<sup>1</sup>, Massimo Cencini<sup>1</sup>, Leonardo Parisi<sup>1</sup>, Marco Acernese<sup>2</sup>, Fabio Santoni<sup>3</sup>, Fabrizio Piergentili<sup>2</sup>, Stefania Melillo<sup>1</sup>, and Andrea Cavagna<sup>1</sup>

<sup>1</sup>National Research Council, Institute of Complex Systems (CNR-ISC), Rome, Italy

<sup>2</sup>Sapienza University, Department of Mechanical and Aerospace Engineering (DIMA), Rome, Italy

<sup>3</sup>Sapienza University, Department of Astronautical, Electrical and Energy Engineering (DIAEE), Rome, Italy

The monitoring of space debris and satellites orbiting around Earth is an essential topic in the space surveillance. The impact of debris, even of small size, against active spatial installations causes serious damage, malfunctions and potential service interruptions. Collision-avoidance maneuverings are often performed but they require increasingly complex protocols. Density of space debris is now so high that even astronomical observations are often degraded by it. Although it does not affect space weather, it may interfere with weather satellites.

We have developed an innovative experimental technique based on stereometry at intercontinental scale to obtain simultaneous images from two optic observatories, installed in Rome (at the Urbe Airport and in Colleparado on the Apennines) and in Malindi (Kenya). From the observations on Earth, it's possible to reconstruct the three-dimensional position and velocity of the objects. The distance between the two observatories is crucial for an accurate reconstruction. In particular, we have considered the sites of Urbe and Colleparado, with a baseline of 80 km, to detect Low-Earth orbits (LEO), while we have considered a baseline of 6000 km, between Urbe and Malindi, to observe geostationary orbits (GEO).

We will present the validation of the three-dimensional reconstruction method via a fully synthetic procedure that propagate the satellite trajectory, using SGP4 model and TLEs data (provided by NASA), and generate synthetic photographs of the satellite passage from the two observatories. Then we will compare the synthetic results with the experimental results obtained using real optic systems. The procedure can be automatized to identify unknown space objects and even generalized for an arbitrary number of sites of observation. The identified debris will be added to the catalogue DISCOS (Database and Information System Characterizing Objects in Space) owned by the European Space Agency (ESA) to improve the space surveillance and the ability to intervene in the case of potential risks.