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CX3D - ON ORBIT 3D MODELING OF SATELLITES

Abstract

Space debris is of growing concern to the global space community. One way to reduce the increase in the number of space debris added each year is by prolonging the on-orbit lifetime of the satellites either by performing on-orbit refueling or with the help of a service satellite. There are various papers and projects related to space debris removal and on-orbit docking, which are either being published and performed or under its way by agencies and companies around the globe. Most of these solutions depend on precious information regarding the status of the target satellite/debris. The target satellite over the year could have been changed due to the effects of space weather, mechanical abrasion/malfunction and damage (especially in case of debris removal). Therefore, it is necessary to have as much information about the target satellite before approaching the target satellite to de-risk mission failure scenarios and to complete the mission. Especially in geostationary orbit, given the communication delay, a geostationary docking requires a sophisticated AI assistant to dock with the target satellite autonomously without needing significant ground assistance. The paper presents a solution to assist the servicing satellite to successfully dock/capture the target by providing a detailed 3d model of the target satellite.

CX3d is a spin-off product of ORUS3D by COMEX SA, which is the only underwater 3d photogrammetry solution certified for metrology by Bureau Veritas that can create 3dmodel of underwater infrastructure with submillimeter resolution. CX3d is a photogrammetry algorithm which produces high resolution and high precision model of a satellite in orbit with the help of image sets and computer vision principle. From a set of images that are seeing the same scene with various angles, CX3d will compute a model that is made of the scene interest points 3D coordinates and the position of the image. The working principles of the CX3d system and the preliminary test results of the CX3d system from the inhouse laboratory test are described in detail in the paper.