

SPACE DEBRIS SYMPOSIUM (A6)
Measurements and Space Surveillance (1)

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AUTONOMOUS DETECTION OF OBJECTS IN LOW EARTH ORBIT BY A NANO SATELLITE
CONSTELLATION

Abstract

Essential services for our daily life in Europe, such as communication, navigation, earth observation or surveillance depend more and more on a continuously working orbital infrastructure. Related space infrastructure of Europe is growing rapidly. The importance of keeping this infrastructure running continuously has been recognized by Europe in recent years and concerns were raised regarding Europe's own capability to monitor these assets appropriately. As a reaction to that, ESA has launched its own space situational awareness (SSA) program recently. SSA contains many different aspects with regard to observation from earth and space, data archiving, processing and dissemination, data policy, control center etc. One of the major aspects of such a system of systems is the capability to make observations also by using space based optical sensors. One of the clear advantages of a space based sensor is the weather independency. A space based sensor would contribute to the whole system by providing additional capability regarding detection, orbit determination, correlation, and possibly characterization.

In this paper a nano satellite constellation for detection of objects in low earth orbits is proposed. The objective of the mission is to autonomously detect and correlate the unknown objects, such as new space debris by optical means. The constellation consists of at least 2 satellites and is capable of autonomously detecting objects in space. After detection, correlation is done in an autonomous way by using advanced techniques. In the event of new objects, short messages are generated and sent to the ground segment within a short time using the ORBCOMM communications system, so that additional observations and verification can be initiated by terrestrial means (telescope, radar, etc.). The satellites contain an optical payload with a large field of view operated in a continuous fashion. Much of the processing is already done autonomously within the payload data handling unit. In the case of detection, short sequences of images or videos are stored on board and downlinked when the satellite is over a ground station. The data volume, which has to be stored and downlinked is reduced to a acceptable level this way. Based on the successful past and ongoing work on satellites at the Julius-Maximilians University of Würzburg and Berlin Institute of Technology new nano satellite concepts are studied for the future. The paper will give an overview and details about the proposed nano satellite system and on the activities at the universities.