29th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Interactive Presentations - 29th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IP)

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VIBE - NOVEL SELF-DIAGNOSTIC SYSTEM BASED ON AI AND DEDICATED FOR SMALLSATS

Abstract

This paper describes the on-going development process of Vision Inspection Boom experiment, part of the mission STARVIBE which is meant to be integrated into the GENASAT-0 microsatellite platform. VIBE is one of the products of SHS, which stands for Satellite Health Scanner, a system designed for satellite self-diagnostics. The main advantage of this payload is the ability to take high-quality images of the satellite and then analyse them using vision algorithms to detect changes in structure. This type of data can be very useful for satellite design teams as it can help determine the causes of failure of individual satellite modules. Camera view angle allows to observe satellite modules such as a telescope, solar panels, or a mechanical structure. This is possible because the camera is placed on a mechanical arm that unfolds after the satellite reaches its target orbit. While designing SHS we decided to create advanced hybrid solution. It is combining cutting edge technology based on machine learning and artificial intelligence with well-known and safe mathematical approach. By combining both areas, we can reach for the best results while keeping proven accuracy and safeness in the environment where it matters the most. SHS introduces machine learning system based on autoencoder neural network. Its main objective is to scan the surface of the satellite and detect changes and occurrence of potential damages. With each iteration, network is studying newly collected data in order to deliver better outcome. Each image obtained from the SHS is briefly analyzed with the advanced mathematical concepts in order to deliver suited metrics

about current satellite state. They allow to act quickly and help to spot potential design issues. On top of its base fault-detection functionality, SHS is able to monitor satellite degradation over longer period of time. Algorithm is designed to track the root of the changes. Collected data can be easily implemented in future design to reduce the downtimes or eliminate risks.