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AN INNOVATIVE DESIGN OF A REUSABLE CONSTELLATION OF CUBESATS FOR SPACE
DEBRIS REMOVAL

Abstract

Space debris is one significant setback in our attempt to explore space and enhance satellite technology. Eradicating this upshot is eminent to our future missions and a safe environment for our planet. The scale of the space junk in the low earth orbit is around few hundreds of thousands and more, sizing from 10s of centimeters in diameter and lower. Although it is inevitable for the space debris to reenter the atmosphere naturally, it is a matter of years and hence the rate is too slow. With advances in the CubeSat technology, a variety of designs are possible for CubeSat systems to function as per the mission requirements. The current paper hence nominates an idea to remove some of the inoperative satellites and it's corresponding components with the help of a constellation of CubeSats that are equipped with distributed actuators for propulsion. The CubeSats are so designed to function as a propulsive device alone with minimal subsystem requirements. The constellation is contained in a cuboidal station with CubeSats docked on all the lateral sides. Once a target body is locked and intended to be removed, the constellation releases one or more CubeSats en route to the target body. Once at site, the CubeSats attach themselves to the target and propel the body to reenter the atmosphere. This constellation station is so designed to be compatible for reusability and the maintenance of such a design is discussed in the paper. The entire approach is thoroughly analyzed investigating multiple designs for the CubeSats. An additional benefit of the proposed idea is to ensure an immediate solution for deorbiting any critically unstable debris in the future in an event of emergency.