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PROPELLANT-LESS CONSTELLATION USING MOMENTUM EXCHANGE OF JOINTED
MULTIPLE CUBESATS

Abstract

These days, small satellites such as Cubesats are applied to a variety of missions such as scientific observations and remote sensing. One of attractive applications that can be relatively easily achieved by small satellites are multi-satellite missions such as formation flights and constellations. Although, the relative orbit between satellites should be actively controlled to achieve these missions, in some cases, it is difficult to minimize the thrusters to an available volume and power consumption for Cubesats. Furthermore, some thrusters cannot be installed under the strict limitations on mass, volume, and power consumption. Herein, the present study proposes a method to realize the constellations without thrusters in Cubesat missions. In the proposed method, the magnetically connected Cubesats are spun up to large angular velocity, and the jointed satellites are separated with electromagnetic force under the environment of central fugal force by the attitude spin. With this method, the satellites can generate orbit control force, and, as a result, the satellite constellation can be achieved without thrusters. After the separation, the error of the orbit transfer evoked by the timing error of the separation is compensated by aero drag force. In this research, the basic concept of the constellation, the technical issues, and the methods to deal with these issues are presented.