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LUNAR ORBIT SATELLITES FORMATION FLYING COLLABORATIVE EXPLORATION

Abstract

In the field of astronomy observation, low frequency is a very important frequency band. By low frequency detection, we can carry out the important research on early universe, solar eruption, galaxy evolution, etc. The discovering the sky at the longest wavelength mission uses lunar orbit micro-satellites formation flying to explore the universe. Each micro-satellite carries a low-frequency interferometer and imager to do low frequency radio detection. This lunar micro-satellite formation flying mission has the constraints of long distance, no navigation, limited onboard resource and limited ground-station available. Meanwhile the characteristics of the mission include cooperative exploration, high precise measurement, large capacity of scientific data, etc., which put forward the requirements of autonomous measurement, autonomous control and intelligent data processing. Firstly, considering the linear formation and the baseline requirements, the relative ranging measurement with microwave link and the relative angle measurement with star camera and light array are proposed. Secondly, with the real-time measured relative-position data, one unilateral limit control method is proposed for autonomous formation control, which is convenient for adaptive formation keeping and control. Thirdly, distributed data receiving and centralized data processing mode is proposed. Daughter satellites receive scientific data and transmit the data to the mother satellite by inter-satellite communication. The mother satellite will perform the intelligent data process onboard to reduce the capacity of downlink data. These new modes provide an efficient and feasible solution for the mission.