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CONTROLLING WEATHER USING A NOVEL SWARM SATELLITE NETWORK

Abstract

The paper addresses the problem of controlling weather around Earth using a novel method based on a swarm satellite network. The proposed satellite network comprises a swarm of satellites placed in different orbits around the Earth. Each satellite is equipped with a mirror and a laser. The mirror is used to redirect the sunlight towards the desired region on the Earth to change the weather temperature while the laser beam is directed towards a storm on the Earth to decrease its speed. The different configurations of the swarm satellite network are considered with a focus on the three-satellite network and four-satellite network. The three-satellite network is comprised of two satellites in the equatorial plane and a third satellite in the polar orbit while the four-satellite network has two satellites in the equatorial plane and two satellites in the polar orbit. The system models of the proposed swarm satellite networks are developed. An attitude control law for each satellite in the swarm network is designed to control its attitude for the required changes in the direction of the sunlight and/or laser beam and thereby, the proposed swarm satellite network maintains the desired weather at the different regions on the Earth. The stability of the proposed controllers is proven using Lyapunov stability analysis. The numerical simulations of the system models along with the onboard attitude controllers are carried out to study the efficacy of the proposed method. Several cases are simulated; swarm satellite network configuration, satellite size, onboard mirror and laser properties, and satellite orbit are varied and their effects on the performance of the swarm satellite network are examined. Results of the numerical simulations of the swarm satellite networks show the feasibility of the proposed method.