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”ORBITAL PIONEERS: SPACE ROBOTICS FOR SPACE SOLAR POWER SATELLITE
DEPLOYMENT”

Abstract

As humanity increasingly exploited conventional and exhaustible sources of energy, it is imperative to look towards space-based solutions for sustainable energy. In essence, the concept of Space Solar Power Satellite(SSPS) emerges as a groundbreaking solution for efficient and eco-friendly energy generation. Unlike terrestrial solar arrays, the proposed model of SSPS offers constant exposure to sun using an origami arrangement of solar panels that beam power to Earth using microwave power transmission systems. However assembly, maintenance and repair of a megastructure like SSPS emerges as a critical challenge. The proposed approach aims to mitigate traditional deployment methods by leveraging advanced robotic technologies for intricate in-orbit assembly tasks. Through simulation and modeling, this paper focuses on developing a robotic outstation with robots capable of inspecting, identifying defects and executing precise repair maneuvers over extended periods. It also explores potential use of autonomous algorithms, human machine interface and teleoperation capabilities for on-the-fly communication, minimizing downtime and maximizing overall lifespan of SSPS.