IAF SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)
Tools and Technology in Support of Integrated Applications (1)

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PAYLOAD-AWARE REINFORCEMENT LEARNING FOR MISSION PLANNING IN 6G LEO SATELLITE CONSTELLATIONS FOR SAFE UAM AND DRONE OPERATIONS

Abstract

This paper presents a payload-aware reinforcement learning (RL) framework for mission planning conducted at the ground control station (GCS) of 6G-based Low Earth Orbit (LEO) satellite constellations. The proposed approach optimizes payload configurations and scheduling to enhance the safe operation of urban air mobility (UAM) and drone systems in the airspace. The RL-based planner dynamically selects optimal operational modes—such as high-throughput for peak demand periods or energy-saving during low traffic—to ensure reliable, low-latency support for aerial missions. Numerial simulations based on a Republic of Korea's 6G project, featuring two LEO communication satellites, demonstrate that the proposed method improves satellite operational efficiency, enhances network reliability, and contributes to overall UAM and drone safety.