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SWARM-BASED MACHINE LEARNING FOR COORDINATED ASTEROID MINING DRONE OPERATIONS

Abstract

Asteroid mining poses significant challenges, demanding innovative solutions to enhance operational efficiency. Building on previous work presented[1] at IAC 2022, this paper delves into the integration of swarm-based machine learning techniques to enhance the efficiency of drone deployment and navigation systems. The primary objective centers around the development of a machine learning model adept at coordinating all drones in a swarm-like manner, thereby optimizing their collective performance in the intricate task of asteroid mining. The papers provides comprehensive insights into the various training techniques and models considered, elucidating their impact on achieving seamless coordination among multiple drones operating within dynamic asteroid environments.

Simulations are presented to showcase the adaptability of the swarm-based machine learning model across diverse conditions, including variations in the number of drones, asteroid characteristics, and mining rates. Notably, the simulations highlight the model's effectiveness in facilitating coordinated movements and resource extraction strategies among the drone fleet. The findings contribute to the ongoing exploration of swarm-based machine learning applications in asteroid mining, representing a step forward in understanding the potential benefits of this approach for future space exploration endeavors.

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[1]Escobedo, Salvador D.; Mariscal, Juan C. *Multi-drone spaceship concept proposal for asteroid mining*