AI Impact & Autonomy on Space Exploration (14)
AI Impact & Autonomy on Space Exploration - Session 4 (4)

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IMPLEMENTATION OF AI ADAPTIVE PRESSURE CONTROL SYSTEM IN SPACE SUITS

Abstract

Astronaut Intravehicular Activity (IVA) and Extravehicular Activity (EVA) suits serve different purposes: IVA suits are used inside the spacecraft and provide protection in case of depressurization or other emergency situations, while EVA suits are worn during spacewalks to protect astronauts in the vacuum of space. Despite their different applications, both suit types share similar functional objectives, including providing fresh air, maintaining temperature, and ensuring pressure regulation. Designing EVA suits is particularly challenging due to the harsh conditions of space and the need to maintain pressure in the vacuum environment. In contrast, IVA suits focus primarily on maintaining astronaut health in the event of a spacecraft depressurization. However, both suit types face the challenge of balancing pressure regulation with astronaut mobility. This paper proposes a model that combines the advantages of both IVA and EVA suits by utilizing Artificial Intelligence (AI) and an adaptive control system to regulate pressure and temperature. The goal is to create a suit that allows astronauts to perform their tasks efficiently and safely, without compromising mobility, regardless of the environment. To achieve this, the study employs mathematical modeling in MATLAB to simulate the interaction between AI algorithms and the adaptive control system. Additionally, the study evaluates the performance of the pressure control system within the proposed suit model.