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AIGC-BASED INTELLIGENT SYSTEM FOR ASTRONAUTS' PSYCHOLOGICAL HEALTH MANAGEMENT

Abstract

As space missions become increasingly complex and prolonged, managing the mental health of astronauts has emerged as a critical challenge. Traditional approaches, which rely primarily on pre-mission psychological screening and training, lack the capability for real-time monitoring and intervention during extended missions. These limitations not only restrict mission durations but also increase operational risks during critical tasks. To address this gap, this study introduces Generative Artificial Intelligence Content (AIGC), a cutting-edge technology leveraging deep learning algorithms trained on extensive psychological and health data. The purpose of this research is to develop and evaluate an AIGC-based multimodal integration framework for astronaut mental health management. This framework continuously monitors astronauts' psychological well-being by analyzing diverse data streams, such as facial expressions, performance metrics, and verbal communication patterns. Based on these comprehensive real-time assessments, the system delivers highly targeted psychological interventions, emulating mental health professionals without requiring additional specialized astronaut training or onsite mental health specialists. The results reveal that the AIGC-driven system significantly outperforms traditional single-dimensional psychological assessment methods in both diagnostic accuracy and intervention efficacy. It ensures astronauts' mental well-being while minimizing mission-critical risks. Comparative analyses demonstrate the system's capability to adapt dynamically to individual psychological needs, thereby enabling prolonged mission durations with enhanced safety and efficiency. In conclusion, the integration of AIGC into astronaut psychological care protocols represents a transformative advancement in space exploration. It provides a robust, scalable framework for ensuring psychological resilience during future long-duration missions to the Moon, Mars, and beyond. These findings underscore the critical role of AI-driven solutions in addressing mental health challenges, paving the way for safer, more efficient, and sustainable space exploration.