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SUSTAINABLE SPACE ENVIRONMENT WITH USE OF ARTIFICIAL INTELLIGENCE AND EMPOWERING EMERGING SPACE NATIONS

Abstract

Space exploration is rapidly expanding, presenting opportunities and challenges in an era marked by technological advancements. The intersection of sustainability, Artificial Intelligence (AI), and space exploration offers promise for securing the space environment and empowering emerging nations. As more countries enter space, addressing Earth's orbit congestion and fostering aspirations of spacefaring nations are imperative. This article explores strategies for space environment security and initiatives to support emerging nations in their space exploration endeavors.

The sustainability of space activities faces a significant threat from Earth's orbit congestion with satellites, debris, and celestial objects. Global efforts and breakthrough technologies, including AI, are crucial to tackle this challenge. AI can monitor and manage space debris, predict collision risks, and optimize satellite trajectories to reduce fuel consumption. Notably, AI algorithms track space debris in real-time, suggesting course corrections to avoid accidents, contributing to a cleaner and safer space environment. NASA's use of AI-driven robots for space exploration tasks demonstrates efficiency, reducing delays and waste. Thus, AI plays a substantial role in achieving the UN's Sustainable Development Goals (SDGs) in securing space.

The technological gap between developed and emerging nations in space exploration poses challenges due to financial constraints and limited expertise. Collaborative efforts, such as joint research programs and technology sharing, can bridge this gap. The International Space Station (ISS) exemplifies international collaboration in groundbreaking research. Additionally, AI integration offers opportunities for emerging nations to advance space programs by automating satellite operations. Emerging nations must be equipped with the latest AI tools to manage satellite functions autonomously, reducing operational costs and reliance on ground control.

To foster sustainability and inclusivity in space exploration, establishing a platform like the International Space Support Services (I3S) is recommended. This platform facilitates swift collaboration between space agencies, enabling expertise sharing and assistance for space missions. The absence of such a platform underscores the need for collaborative efforts among space-ambitious nations. In conclusion, by embracing AI-driven solutions and fostering international collaboration, the benefits of space exploration can be shared globally, transcending national boundaries for humanity's collective advancement.