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LEGAL FRAMEWORK FOR EMERGENCY RESPONSE IN SPACE TRAFFIC MANAGEMENT UNDER THE EMPOWERMENT OF ARTIFICIAL INTELLIGENCE

Abstract

The construction of legal mechanisms for Space Traffic Management (STM) and emergency response is a key step in ensuring the safety and sustainable development of outer space. STM currently faces three core challenges: the absence of an international legal framework and insufficient coordination mechanisms, conflicts between national sovereignty and international cooperation, and issues related to the transparency of space traffic information and the allocation of legal responsibilities.

The influence of Artificial Intelligence (AI) algorithms in outer space cannot be ignored. If AI technology is integrated and strengthened within STM emergency response mechanisms, it will further enhance STM's ability to quickly respond to emergencies. AI can significantly improve real-time analysis and processing capabilities regarding satellite collision warnings and avoidance, satellite malfunctions or communication disruptions, and the generation and spread of space debris. This enhances the overall system's emergency response speed and accuracy.

However, AI's application also introduces new legal challenges for STM: a)In AI-enabled space monitoring and warning systems, issues of liability and decision transparency and interpretability emerge. b)In AI-supported international coordination and cooperation, global data sharing, coordination, and the automation of cross-border emergency responses present challenges. c)In AI-assisted emergency responses, issues such as the legal recognition of AI decisions and the prioritization of AI decisions during emergencies must be addressed.

Therefore, in constructing effective legal mechanisms for STM emergency response, it is crucial to consider the legal status of AI, decision transparency, data-sharing frameworks, and legal guarantees for cross-border coordination. To address these challenges, this paper proposes three key measures:

1.Under the leadership of the United Nations, a global space traffic management treaty should be formulated, and an international coordination body, similar to the International Civil Aviation Organization (ICAO), should be established to regulate AI's application and cooperation globally.

2.Each nation should improve its domestic legal framework to support international mechanisms and provide a legal basis for AI-driven emergency response systems, ensuring alignment between domestic and international law.

3.A global platform for space data sharing and coordination should be established to enhance international cooperation and transparency, ensuring AI systems have sufficient data to achieve optimal emergency response outcomes.

Through these measures, the global community can establish a more efficient, intelligent STM emergency response system, supported by AI, to ensure the safety and sustainable use of outer space. This will not only help address existing legal framework deficiencies but also promote international cooperation and improve global space governance capabilities.