

The Use of Artificial Intelligence in the Context of a Space Traffic Management System: Legal Aspects

Authors : George Kyriakopoulos, Photini Pazartzis, Anthi Koskina, Crystalie Bourcha

Abstract : The need for securing safe access to and return from outer space, as well as ensuring the viability of outer space operations, maintains vivid the debate over the promotion of organization of space traffic through a Space Traffic Management System (STM). The proliferation of outer space activities in recent years as well as the dynamic emergence of the private sector has gradually resulted in a diverse universe of actors operating in outer space. The said developments created an increased adverse impact on outer space sustainability as the case of the growing number of space debris clearly demonstrates. The above landscape sustains considerable threats to outer space environment and its operators that need to be addressed by a combination of scientific-technological measures and regulatory interventions. In this context, recourse to recent technological advancements and, in particular, to Artificial Intelligence (AI) and machine learning systems, could achieve exponential results in promoting space traffic management with respect to collision avoidance as well as launch and re-entry procedures/phases. New technologies can support the prospects of a successful space traffic management system at an international scale by enabling, inter alia, timely, accurate and analytical processing of large data sets and rapid decision-making, more precise space debris identification and tracking and overall minimization of collision risks and reduction of operational costs. What is more, a significant part of space activities (i.e. launch and/or re-entry phase) takes place in airspace rather than in outer space, hence the overall discussion also involves the highly developed, both technically and legally, international (and national) Air Traffic Management System (ATM). Nonetheless, from a regulatory perspective, the use of AI for the purposes of space traffic management puts forward implications that merit particular attention. Key issues in this regard include the delimitation of AI-based activities as space activities, the designation of the applicable legal regime (international space or air law, national law), the assessment of the nature and extent of international legal obligations regarding space traffic coordination, as well as the appropriate liability regime applicable to AI-based technologies when operating for space traffic coordination, taking into particular consideration the dense regulatory developments at EU level. In addition, the prospects of institutionalizing international cooperation and promoting an international governance system, together with the challenges of establishment of a comprehensive international STM regime are revisited in the light of intervention of AI technologies. This paper aims at examining regulatory implications advanced by the use of AI technology in the context of space traffic management operations and its key correlating concepts (SSA, space debris mitigation) drawing in particular on international and regional considerations in the field of STM (e.g. UNCOPUOS, International Academy of Astronautics, European Space Agency, among other actors), the promising advancements of the EU approach to AI regulation and, last but not least, national approaches regarding the use of AI in the context of space traffic management, in toto. Acknowledgment: The present work was co-funded by the European Union and Greek national funds through the Operational Program "Human Resources Development, Education and Lifelong Learning " (NSRF 2014-2020), under the call "Supporting Researchers with an Emphasis on Young Researchers - Cycle B" (MIS: 5048145).

Keywords : artificial intelligence, space traffic management, space situational awareness, space debris

Conference Title : ICIRSD 2021 : International Conference on Impact and Remediation of Space Debris

Conference Location : Copenhagen, Denmark

Conference Dates : July 19-20, 2021