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COMMERCIAL, POLITICAL AND TECHNICAL CHALLENGES OF SPACE DEBRIS
DATA-SHARING: A CONCEPTUAL FRAMEWORK

Abstract

More than 30000 tracked artificial objects and millions of untracked ones orbit around the Earth, and the probability of their collision with operational spacecraft keeps increasing with time, as new launches are performed and space objects crash and explode creating more fragments. Among the identified shortcomings of the current endeavour to mitigate the risk posed by space debris, one is related to the present tracking capabilities, which are limited not only by technology development, but also by the interests of private and national organisations. Publicly available tracking data is often of limited accuracy, while private companies selling tracking data prevent their clients from comparing or complementing their estimations with the ones coming from other sources. In response to the increasing number of space objects and the rise of NewSpace start-ups that aim at providing space-based observations, which broaden the amount of available space objects catalogues even more, this paper suggests a new data-sharing framework. Originating from a blockchain concept, the suggested structure would allow space operators to buy anonymised local tracking data, selected based only on relevance, accuracy and price. Contrary to the traditional approach, operators would not buy full catalogues, but instead would just purchase access to tracking data of objects in the vicinity of their own satellite or constellation. Moreover, the proposed methodology would appeal to a wide variety of users, which range from private companies to academic institutions. After giving a holistic picture of the proposed data-sharing framework and discussing its technical and implementation challenges, this paper investigates the possible pricing strategies and competition implications of the commercial market segment. In particular, an in-depth focus is set on the role of private players and on the challenges they face to adapt their business model. Then, the paper analyses the case study of a start-up working in the field of space traffic management, and discusses the pattern of development and the niche strategies that could be adopted during market formation to overcome the barriers to large-scale diffusion of the proposed data-sharing framework. An evolutionary model is used to suggest a plausible pattern of development, which is compared to other radical innovations, such as communication technologies.