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MULTI-TARGET TRACKING MANAGEMENT FOR A MULTIFUNCTIONAL RADAR IN SPACE SITUATIONAL AWARENESS

Abstract

With the increasing of human space activities, the space object population has consistently risen during the last several decades. There are currently more than 20,000 tractable objects in Earth orbit, 1,300 of which are active. With so many objects populated in space and new objects added at ever year, ensuring continued access to space is quickly becoming an urgent problem.

The science of space situational awareness (SSA) has been practiced and developed from the time of Sputnik. The rapidly increasing number of resident space objects will require commensurate improvements in SSA. Multifunctional Radar is an important tool in SSA. Tracking sensors are scarce resources that must be optimal managed to obtain measurements of maximum utility.

In the SSA scenario, where multiple targets exist in the field of view of multifunctional radar, different targets may require rather different allocations of resources for proper tracking due to their different speeds and locations. Tracking management is an important problem of radar resource management and has been the focus of intensive research in order to optimize the process of accomplishing a set of measurements to be performed by a multifunction radar system. Multi-target tracking is mainly challenged by the difficulty in fast and accurate data association. A new approach for multi-target tracking and tracking management is proposed. We first proposed a quick short arc initial orbit determine algorithm and analyzed its propagation precision along with the propagation period, and then associated the new measurement with the determined orbits. Once data association is established, targets can be tracked separately using the associated measurements, in conjunction with track fusion for improved accuracy, and scheduling the next observation of the special target with the propagation information. Numerical simulations show the ability of the proposed algorithm for tracking multi-targets in space surveillance awareness.