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VALUE-ADDED SERVICES AT GEO DERIVED FROM PERSISTENT OBSERVATION

Abstract

Beginning in 2019, persistent observation of space objects near Geosynchronous Orbit is achieved. With greater than 300 telescopes observing better than 3000 objects above 8000 km altitude, ExoAnalytic Solutions provides significant capability derived from an 18 hour per day duty cycle with continuous observations of deep space objects (>750,000 observations across the deep space object population per night). In this work we establish a technical definition for when space objects are observed persistently and explain key value-added services which are supported by such a data collection strategy. We compare this to the timelines and characteristics of common, anomalous, and evolving deep space traffic events including spacecraft maneuvers, slot changes, changes in orientation, and debris producing events observed. In contrast to historical trends which have led to the current state of the art in Space Situational Awareness (SSA) and Space Traffic Management (STM) services, we investigate the many other useful and informative services which are supported by a persistent observation approach. These services go beyond coarse conjunction assessment achieved by fusing data from sparse and heterogeneous sensors. In addition, the frequency at which deep space object measurements by geometrically distributed optical sensors may be mapped to new, precise state vector estimates is investigated and compared using real results obtained when observing objects which exhibit frequently maneuvering and long duration maneuvers. We argue that predictive analytics based on more frequent state vector estimates result in a more reliable understanding of modern deep space objects than predictions derived from sparse data collections which are mapped to state vectors with less frequency. Finally, an option for a democratized approach to space traffic management for deep space objects is discussed which enables GEO operators to opt-in to services focused on their systems and based on a persistent data paradigm. Such an approach has the potential to significantly reduce the occurrence of non-precise conjunction warnings, support additional services such as antenna calibration, and enables a bottom-up approach to space traffic management which keeps spacecraft operators, the ultimate customer for STM services, in control.