

Utilizing Novel Non-Traditional Sensor Tasking Approaches to Enhance the Space Situational Awareness Picture Maintained by the Space Surveillance Network

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The Space Surveillance Network (SSN) is tasked with the increasingly difficult mission of detecting, tracking, cataloging and identifying artificial objects orbiting the Earth, including active and inactive satellites, spent rocket bodies, and fragmented debris. Much of the architecture and operations of the SSN are limited and outdated. Efforts are underway to modernize some elements of the systems. Even so, the ability to maintain the best current Space Situational Awareness (SSA) picture and identify emerging events in a timely fashion could be significantly improved by leveraging non-traditional sensor sites.

Orbit Logic, the University of Colorado and the University of Texas are developing an innovative architecture and operations concept to coordinate the tasking and observation information processing of non-traditional assets based on information-theoretic approaches. These confirmed tasking schedules and the resulting data can then be used to “inform” the SSN tasking process. The ‘Heimdall Web’ system is comprised of core tasking optimization components and accompanying Web interfaces, are supported by a secure, split architecture that for the first time allows non-traditional sensors to support SSA while improving SSN tasking.

Heimdall Web application components appropriately score/prioritize space catalog objects based on covariance, priority, observability, expected information gain, and probability of detect - then coordinate an efficient sensor observation schedule for non-SSN sensors contributing to the overall SSA picture maintained by the Joint Space Operations Center (JSpOC). The Heimdall Web Ops concept supports sensor participation levels of “Scheduled”, “Tasked” and “Contributing”. Scheduled and Tasked sensors are provided optimized observation schedules or object tracking lists from central algorithms, while Contributing sensors review and select from a list of “desired track objects”. All sensors are “Web Enabled” for tasking and feedback, supplying observation schedules, confirmed observations and related data back to Heimdall Web to complete the feedback loop for the next scheduling iteration.