Paper ID: 82325
oral
student

57th IAA SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (D5)
Emerging trends of knowledge management in organizations (2)

Author: Mr. Robert Rovetto
American Institute of Aeronautics and Astronautics (AIAA), United States

KNOWLEDGE REPRESENTATION AND MODEL-BASED SYSTEMS ENGINEERING FOR SPACE DATA STANDARDS AND FUNDAMENTALS

Abstract

Capturing knowledge (broadly construed) in a computer tractable, yet naturally readable, manner is often a task of knowledge representation (KR) in artificial intelligence research. Model-based systems engineering (MBSE), which often takes a deep-dive into technical systems, overlaps with KR in terms of modeling and semantic content. They vary with regard to the degrees of abstraction, formality, and tooling. The aim is to symbolically capture various sorts of data and information about space systems and operations. Following the authors 2022 and 2017 International Astronautical Congress papers, this paper summarizes the in-progress development of a family of KR and MBSE models for orbit and other navigational data. Taking a knowledge-based approach, semantic artifacts such as ontologies are produced for standard data formats such as the CCSDS Navigation Data Messages (NDM) and the Two-line Element set (TLE). The models with their KR formats are proposed as novel additions to the existing set of extensible orbit data formats found in SSA data sources such as CelesTrak.org, Space-Track.org, and the in-progress TraCSS space traffic coordination system. Each model formalizes the intended meaning of the content and constructs of each data format, message and content. This should afford additional computational capabilities, as well as conceptual and semantic precision by using abstract distinctions provided by the techniques, formalisms, and project methodology. They thereby stand to contribute to global space data standards, which in turn serves as a use-case for KR and MBSE approaches. Supplementing this is abstractly modeling fundamental knowledge in the form of knowledge organization systems, fundamentals such as orbital concepts and principles from astronautics and astronomy. This broad, transferable common knowledge are examples of topics KR and MBSE can attempt to formalize in a reproducible, patterned and scalable manner. Orbit data and other such topics are within the scope of the wider project developing these abstract models and associated terminologies for the space domain. Readers interested in supporting and collaborating are encouraged to contact the author on this promising line of research.