IAF ASTRODYNAMICS SYMPOSIUM (C1)
Virtual Presentations - IAF ASTRODYNAMICS SYMPOSIUM (VP)

Author: Mr. Thomas Roberts
Massachusetts Institute of Technology (MIT), United States, thomasgr@mit.edu

Prof. RICHARD LINARES
Massachusetts Institute of Technology (MIT), United States, linaresr@mit.edu

SATELLITE REPOSITIONING MANEUVER DETECTION IN GEOSYNCHRONOUS ORBIT USING TWO-LINE ELEMENT (TLE) DATA

Abstract

This paper proposes an approach to detect satellite repositioning maneuvers using a one-dimensional convolutional neural network (CNN) trained with geosynchronous longitude measurements calculated from publicly available two-line element (TLE) data. Unlike other orbital regimes, geosynchronous orbit (GEO) is particularly well-suited for measuring satellite positions using geographic coordinates. Under this convenient measurement system, satellites' positions are labeled with the geographic longitude and latitude of their sub-satellite points as well as their altitude above the Earth's surface. For a space object precisely in geostationary orbit, with a period equal to one sidereal day and no inclination or eccentricity, longitudinal measurements are approximately constant over short time periods. For other geosynchronous space objects that are not precisely in geostationary orbit, such as inactive satellites that no longer pursue station-keeping maneuvers, longitudinal measurements vary with time. This paper discusses how to create a labeled dataset of satellite repositioning maneuvers in geographic coordinates and use it to develop a maneuver detection algorithm. A preliminary algorithm design is described, for which results are presented and evaluated.