Detection of Cassini-Huygens Spacecraft Trajectory Modifications

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Abstract

When Cassini Huygens interplanetary mission finished in October of 2017 the orbiter had accomplished 294 orbits around Saturn and rectified its trajectory for several hundred times. Formed orbits of the spacecraft surrounding the planet Saturn match a conglomerate of yarn spurted in the absence of threads clipping. The loops extending in every direction are protracted in some locations and modicum in others. Despite that, they come into sight untidy, the sum of orbits that the spacecraft made indicates cautiously choreographed, a series of prolonged dance across the space that separating Titan and Cassini. Throughout the duration of the related taken courses by Cassini, the gravitational assistance of the satellites mostly (Titan) are utilized in order to adjust and regulate the orbit, earmarking from any extent satellite flyby the following one. In the last 13 years of the project there were captured more than 400,000 samples, each record including pictures about Saturn or its icy moons as well as large sensory data amount of the orbiter. There were necessary trajectory modifications during the movement. The radio control signal propagation time between the Earth and orbiter was in the order of 80 minutes. Carefully sent navigation commands were necessary to produce optimum of the energy consumption for orbit modification of the Cassini spacecraft. In the scale of tens of minutes of signal propagation time and 1.4 billion kilometre size of channel complex event detection in the orbit modifications requires special investigation and analysis of the collected big data. The paper provides analysis method of these events based on multiple data series sampled.

Keywords: Cassini-Huygens interplanetary project, extreme event, complex event processing, special event processing, sensory data, big data, pattern processing.

MSC: 65C60, 60G35, 91A28

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