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AN ATTITUDE MODEL FOR THE SPACECRAFT OF THE ESA MISSION GAIA

Abstract

The European astrometry mission Gaia will set new standards for the accuracy of position and velocity of up to a billion objects in the universe. This implies an extensive effort in the processing of the measurement data at the highest possible level of physical fidelity. Studies related to the precursor Hipparcos have shown that the fully-dynamical modelling of the spacecraft's attitude leads to significant improvements in the understanding of the spacecraft's real behaviour in space and eventually in the high quality of the scientific results. As a consequence, the desired level of accuracy of Gaia's scientific output is only achievable, if one gets a thorough knowledge of the spacecraft and its parameters by establishing techniques for attitude and disturbance torque modelling - to be ready in advance of the launch.

The 'Gaia Attitude Model' (GAM) focusses on the development of a simulation environment based on physical principles and effects, complemented by information from the onboard architecture of software and hardware to control the spacecraft's motion in space. GAM contains accurate models for all essential parts of a spacecraft simulator for utilization in the scientific data analysis. GAM can not only be used to calibrate and improve the incoming data during the mission lifetime but also to augment the data quality in the post-mission data handling.

This talk presents the major parts of the GAM and shows the steps in the development of a high-precision tool for simulating Gaia's attitude.