METHOD FOR AUTONOMOUS ORBIT CONTROL AND SATELLITE CONFIGURED TO IMPLEMENT THE METHOD

Technological advantages

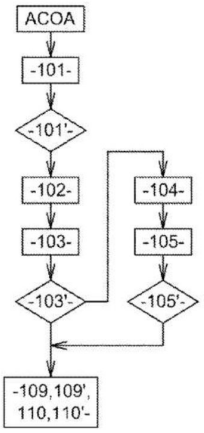
- Fully autonomous onboard management of station-keeping and collision avoidance.
- Sliding prediction horizon with a frozen segment ensuring operational stability.
- Highly responsive to orbital perturbations and unexpected conjunctions.
- Native integration of mission constraints and authorized maneuver windows.
- Progressive and hierarchical collision avoidance strategy, from nominal to emergency cases.

Invention synthesis

This invention relates to a method and a system for autonomous orbit control that natively integrates collision risk management onboard satellites, particularly in low Earth orbit. The system periodically computes a maneuver plan over a sliding time horizon, including a part that cannot be modified and a recalculable part. At each activation, the satellite evaluates the collision risk associated with its predicted trajectory using available conjunction data. If the risk remains acceptable, the maneuver plan is executed and stored. Else, the system incrementally adjusts the trajectory and generates a dedicated collision avoidance maneuver plan using priority time windows. This approach enables simultaneous station-keeping, collision avoidance, and mission continuity without reliance on ground segment reaction times.

Potential applications

- Low Earth orbit satellites subject to strong atmospheric drag variations.
- Satellite constellations requiring distributed autonomous operations.
- Earth observation missions with high availability constraints.
- Satellites operating in congested orbital regimes.
- Low-thrust platforms with fine maneuver planning.



Schematic of the method

(101) Activation of the maneuver plan
(102) Determine a maneuver plan PMA
(103) Identification of a collision risk
(104) Determine a new maneuver plan NPMA
(105) Search for a new trajectory
(105') New collision risk
(109,110) Save and transmit new maneuver plan to propulsion and attitude control system

Commercial benefits

- Reduced operational dependency on ground control systems.
- Lower risk of satellite loss due to collisions.
- Increased service availability and mission continuity.
- Easier compliance with emerging space traffic management regulations.
- Enhanced market value of satellites as high-autonomy systems.

Patented invention - under license.

For more information :

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