AUTONOMOUS CONTROL SYSTEMS FOR SATELLITE FORMATION FLYING

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Abstract

Frequently mentioned motivations of formation flying are larger aperture for measurements, more flexibility, smaller total weight and therefore better economy, potential for better reliability with redundancy, etc. Major project currently in the planning and construction phase are the NASA terrestrial planet finder (TPF), DARWIN extra-solar planet search, laser antenna LISA for the detection of gravity waves, X-ray telescope XEUS, earth observation SAR-Lupe, TerraSar, Cartwheel and many more.

Some of the technical challenges are: precision control of position and attitude, automatic reconfiguration of formation in case of sensor, actuator or payload failures, drift safety, collision avoidance and overall autonomy and reliability of the whole system.

The talk will look at the technical details of

(1) data fusion of measurements taken by the whole cluster,

- (2) the underlying adaptive control scheme for attitude and position,
- (3) the planner system,
- (4) the communication and command structures and
- (5) a multi agent architecture for the cluster.

The simplest reactive agent structure is advocated that can be verified if the continuous physical models abstracted and discretized.