Precision Control System Challenges for Drag-Free and Pointing Missions

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Abstract

EADS Astrium is involved in the development of drag-free control systems for scientific instruments and precise pointing control systems for Earth observation spacecraft, with technical support of the University of Stuttgart. These two control systems types are very much different at a first glance, however a closer look shows that there are yet some commonalities that could be exploited in the future. In the first part of this talk, recent experiences gained during the development of the LISA Pathfinder drag-free control system are presented, where emphasis is put on the control design process (control structure, systematic performance breakdown, controller optimization procedure, functional architecture of the on-board software, etc.). Then, several control related research areas are identified, that will potentially lead to an improvement and/or are required in the future.

In the second part of the talk, the class of pointing control system that is of particular interest for EADS Astrium GmbH is characterized (requirements, system design baseline, such as e.g. reaction wheels rather than CMGs). Areas of future research are identified from two points of view: activities driven purely by the mission and the system baseline, respectively; and activities that attempt to apply design principles that were established in the drag-free field (and presented in the first part of the talk, such as requirements formulation, associated design optimization methods, etc.) to pointing systems.