Oct 19, 2017

Imaging Satellites Challenges in Dynamics and Control

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ABSTRACT:

Imaging satellites have several challenges in dynamics and control to meet high performance requirements. As an example, Hubble Space telescope pointing requirements of 0.012 arc-sec, jitter requirements not to exceed 0.007 arc-sec. These satellites require fast slew maneuver with minimum slew time. Flexibility/control interaction becomes critical for these satellite. These satellite require fine mirror surfaces for diffraction limited performance. For visible images, the surface mirror accuracy requirements are minimum 30 nm. In order to meet these performance requirements, advance dynamics and control techniques and actuators and sensors are required. To meet these requirements becomes even more challenging for future imaging satellites as the diameter of primary mirrors increase, resulting in deployable mirrors. This presentation provides an overview of advanced dynamics and control techniques for jitter control, flexibility/ control interactions, slew maneuvers, and reflector active surface control.

BIOGRAPHY:

Dr. Brij N. Agrawal is currently a Distinguished Professor in the Department of Mechanical and Aerospace Engineering, Director of the Spacecraft Research and Design Center, and Director of the Adaptive Optics Center of Excellence for National Security at the Naval Postgraduate School (NPS). He has developed teaching and research programs in spacecraft design, acquisition, tracking and pointing, jitter control, and adaptive optics control for imaging spacecraft, laser communications, and high energy laser beam control. Prior to Joining NPS in 1989, Prof. Agrawal worked for twenty years for Communications Satellite Corporation (COMSAT) and International Telecommunications Satellite Organization (INTELSAT) . Professor Agrawal wrote the first textbook on spacecraft design: "Design of Geosynchronous Spacecraft." He has been a thesis advisor for ten Ph.D. and 40 MS students. He has three patents, one on attitude control , second on jitter control, and third on Control Moment Gyro Control. Prof. Agrawal has published over 150 papers in journals and conference proceedings. He has received several prestigious awards. He earned his Ph.D. in Mechanical Engineering in 1970 from Syracuse University, MS in Mechanical Engineering in 1968 from McMaster University, ME (Hons) in Mechanical Engineering from IIT Roorkee, and B.Sc. (Hons) in Mechanical Engineering in 1964 from IIT (BHU). He is a Fellow of the American Institute of Aeronautics and Astronautics (AIAA), a member of International Academy of Astronautics.