In this paper, the interaction between the attitude control system and the flexible structure of an artificial satellite during orbit transfer maneuvering has been investigated. The satellite was modeled by a rigid central body with one or more flexible appendages. The dynamics equations were obtained by a Lagrangean approach. The flexible appendages were treated as a clamped-free beam and its displacement was discretized by assumed-mode method. In the satellite transfer maneuver a typical Hohmann procedure and a burn-coast-burn strategy were used, the attitude was controlled by on-off controller. As a result, it was verified that if any jet fire cycling near the fundamental frequency of flexible appendages, a possibility of the interactions between control system and flexible structure can exist which could damage the performance of control system. Therefore, as security, in the control system design a bandwidth with one decade below of first natural frequency of the flexible structure should be used.

Keywords: *Estruturas Flexíveis, Sistemas de Controle, Transferência de Órbita / Flexible structures; Control Systems; Orbit Transfer*

COB1338 DYNAMICS AND DESIGN OF AUTONOMOUS ATTITUDE CONTROL OF A SATELLITE USING FUZZY LOGIC

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Fuzzy logic has rapidly become one of the most successful of today's technologies for developing sophisticated control systems. With its aid, complex requirements may be implemented in very simple, easily maintained and low cost controllers, suitable for small satellites. The increase of satellite autonomy is a continuing goal for improving its performance and reducing its operations costs. One approach to this autonomy is to use fuzzy logic in the controller, specially under modeling uncertainties, which has several features that make it a useful tool for maneuver automation. This current analysis investigates the use of a fuzzy logic controller to the acquisition and control of rotation of a spin stabilized satellite. It is possible to control the satellite motion around its spin axis through the correct switching of two magnetic coils within specified ranges by fine tuning the fuzzy control set domains and by adapting them automatically to reduce error tolerance. Such controller is currently under development and its effects on the satellite dynamics and control will be discussed and compared with a classic controller in this work. Several advantages were found under this approach, including simplicity, flexibility and robustness.

Keywords: *Fuzzy Logic Control; Satellite Attitude Control; Operational autonomy / Controle Nebuloso; Controle de Atitude de Satélites; Autonomia Operacional*

COB1339 SIMULAÇÃO DIGITAL EM TEMPO REAL DE UM SISTEMA DE CONTROLE DE ATITUDE MAGNÉTICO AUTÔNOMO DE UM SATÉLITE ESTABILIZADO POR ROTAÇÃO/*REAL TIME DIGITAL SIMULATION OF AN AUTONOMOUS GEOMAGNETIC ATTITUDE CONTROL SYSTEM OF A SPIN STABILIZED SATELLITE*

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This work discuss the project and the real time simulation of the Attitude Control Systems-ACS of satellites with geomagnetic attitude control. It has the first Brazilian Scientific Applications Satellite-SACI1 as application, that will have an autonomous attitude control and will be spin-stabilized with active spin rate and precession control through magnetic torque coil interactions with the geomagnetic field. The work: 1) shows how to use system integrated development tools such MATRIXX or MATLAB; 2) shows the mathematical model development with the system dynamics and the controller project and analysis; 3) shows the system closed loop real time simulation process through language C software codification, and 4) shows the simulations done so far.

Keywords: *Simulation/Simulação, Tempo Real/Real Time, Controle de Atitude/Attitude Control*

COB1342 UTILIZANDO O MATLAB PARA O CONTROLE DE UM SIMULADOR DINÂMICO EM TRÊS EIXOS/ *USING MATLAB TO CONTROL A THREE AXIS DYNAMIC SIMULATOR*

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This work presents the description of an interface software between MATLAB and a three axis dynamic simulator Contraves 53M2-30H. The host computer is an IBM-PC which communicates with the simulator by means of a dedicated interface specially built for this purpose. A software writen in C enables to command the simulator exactly in the same way as if it the command keyboard of the simulator controller were used. An aditional set of routines that are not built in the simulator controller like multiple rate or position reads was also developed. Based on both sets of routines it was developed an interface software with MATLAB that enables the user to access all the control functions of the simulator directly from the analysis environment of that software.

Keywords: *Real Time, Interactive Software, Attitude Control, Physical Simulation, Hardware in the Loop Tempo real, Software Interativo, Controle de Atitude, Simulação Física, Hardware em malha*

COB1492 MODELAGEM, SIMULAÇÃO E RESULTADOS DE UM EXPERIMENTO DE CONTROLE DE UMA UNIDADE TÉRMICA/*MODELING, SIMULATION AND RESULTS FOR A THERMAL UNITY CONTROL EXPERIMENT*

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This work shows the development of an experiment implemented at a Control Systems Laboratory focusing Mechanical Engineering students. The objetives to be achivied with this equipment