

SPACE POWER SYMPOSIUM (C3)  
Space Power Technologies and Techniques (2)

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A SIMULATION TOOL FOR SPACE POWER SYSTEM: THE INTEGRATION OF INTELLIGENT  
CONTROL ALGORITHMS AND POWER SYSTEM MODELS

**Abstract**

Software simulations provide engineers the ability to experiment with spacecraft systems in a computer-imitated environment. Engineers currently develop software models that encapsulate spacecraft system behavior. These models can be inaccurate due to invalid assumptions, erroneous operation, or system evolution. Increasing accuracy requires manual calibration and domain-specific knowledge. Aiming at the space power system, this paper presents a method for establishing simulation software, and uses it on the spacecraft power system designing, validation and simulation. In this paper, relative knowledge of spacecraft orbit and attitude is introduced. Then the analyzing and designing for the main components are given. The simulation algorithm and models are finally set up on it. This paper is based on Simulink technology. Receiving the data from STK (Satellite Tool Kit) software, it realizes the real-time simulation of the power system. The system considers the influence by the attitude changing and different load courses, and finishes the modeling for power system working. The modularized structure makes the system extend easily and simplifies the process of spacecraft mission analyzing and designing. The efficiency and correctness are well increased. The most different between this software and other products is that we integrate the power system scheduler, load management and FDIR (fault diagnose, isolation and recovery) algorithms to the simulation system. Using this software, users can acquire the full validation of power system (either hardware or software products). Evaluations using actual sensor data and existing EPS (electric power system) demonstrate the success of this approach. Final discussions include impending use of this technology for space mission operations and the need for simulation in future Space Exploration.