Desarrollo de un sistema de gestión de baterías utilizando Simulink

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Motivation

Collaboration

Short Iteration Cycles

Safety Critical System
What is BMS?

**Software**

- Supervisory tasks
- SOC estimation
- Contactor management
- Isolation monitoring
- Fault detection and recovery
- Thermal Management
- Current & Power Limits

**Electronics**

- Block Voltage, Temperature Measurement
- Cell Diagnostic
- Cell Balancing

**Battery Pack**

- Demo

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Start with Simulation
Battery Cell ↔ Large Battery Pack
Develop & Test Algorithms in Simulink
Generate C/C++ Code From BMS Algorithm Models
Perform HIL Testing for BMS ECUs

Testing ECUs with Battery Cells
• Longer test cycles
• Difficult to reproduce results
• Limited test automation
• Difficult to test fault conditions
Perform HIL Testing for BMS ECUs
Perform HIL Testing for BMS ECUs
IO991: Battery Emulation I/O Module

Key Features:
- 6 independent isolated channels
- Architecture allows series & parallel combinations
- Independent power and sense lines
- Voltage range of 0-7 V with 14-bit resolution
- 300 mA source to load
- 100 mA sink adjustable in 16 steps

Enables:
- Test automation and repeatable testing
- Fault testing safely
- Reuse testcases from earlier desktop testing
Summary

Multi-Domain

Collaborate Across Domains

Long Iteration Cycles

Reduce Iteration Time

Safety Critical System

Functional Safety Certification

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Taking It Further

Parameter Estimation

Model Checks

Model Coverage

Test Automation

Design Error Detection

HDL Code Generation

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Learn More about Battery Management System

WHITE PAPER
Developing Battery Management Systems with Simulink and Model-Based Design

https://www.mathworks.com/discovery/battery-models.html

MathWorks®
Battery Modeling
Model batteries when designing battery-powered systems

Technical Articles and Newsletters
Modeling and Simulating Battery Performance for Design Optimization

By Cecilia Wang, Romeo Power

Battery Modeling
Examples and How To
- Battery Management System Development in Simulink (7:17) - Video
- Lithium Battery Model with Thermal Effects for System-Level Analysis (24:05) - Video
- Automating Battery Model Parameter Estimation using Experimental Data (25:28) - Video
- Real-Time Simulation of Battery Packs Using Multicore Computers (22:57) - Video
- Battery Simulation and Controls - Consulting Services
- Sifting Through Multisource Data for Safer Battery Materials with Machine Learning - Article

Papers
- High Fidelity Electrical Model with Thermal Dependence for Characterization and Simulation of High Power Lithium Battery Cells - IEEE 2012
- Battery Model Parameter Estimation Using a Layered Technique - SAE 2013
- Simplified Extended Kalman Filter Observer for Battery SOC Estimation - SAE 2013
- Battery Pack Modeling, Simulation, and Deployment on a Multicore Real Time Target - SAE 2014
- Model-Based Parameter Identification of Healthy and Aged Li-ion Batteries for Electric Vehicle Applications - SAE 2015