



Integrated Testbed for Battery Management System (BMS)

The goal of this thesis is the development of a Hardware in the Loop (HiL) and Software in the Loop (SiL) testbed for a Battery Management System (BMS). The testbed contains a battery simulator, which is connected to the BMS under test. With this simulator the testbed should create safety-relevant faults and checks if the BMS reacts correctly to those.

Problem Statement

Battery Management Systems (BMS) are electronic systems which manage rechargeable batteries, e.g. monitoring the batteries state and assuring that the battery is always kept in a safe state. The goal of this thesis is to develop an integrated testbed which physically simulates a battery and checks the behavior of the BMS. The testbed consists of

- an embedded industry PC running Windows, which controls the testbed,
- the battery simulator, which generates the cell voltage and temperature signals,
- the BMS, which is the system under test,
- generators for the battery pack current and voltages,
- the sensor modules of the BMS, which are attached to the battery simulator and the current and voltage generators and
- switches to inject faults (isolation failure, sensor cable broken, etc.)

Goals/Motivation

- Provide a controlled and automated test environment for both the hardware and software of the BMS.
- The test environment should be able to simulate all critical situations and safety-relevant faults that the BMS is supposed to detect.

Solution

- At the heart of the automated test system is the embedded PC Beckhoff CX5130, which controls the complete test system.
- Connected to the embedded PC are the BMS modules, and also further peripherals necessary for fault simulation.

Requirements

- You have a good knowledge of software engineering and especially testing.
- You are aware of and interested in Runtime Verification techniques.
- You are capable of making things work in real-world applications.

Industry Cooperation

You will work in close collaboration with an established industry company with a strong background in the field of battery management solutions located in Munich. This company will provide the hardware including the battery simulation technology, the BMS under test and the integration in the test bed and the embedded control PC. The main goal of this thesis is to design and implement the test framework controlling the test bed.