

Abstract

In recent years, high voltage batteries are considerably used in electric cars. The AUDI AG develops high voltage batteries for the application in their vehicles. To optimize the usage of the high voltage battery and to provide its safety, the battery management system (BMS) is used to control the battery. To achieve this goal, the battery management system has three control units that communicate with each other. One of them is the cell management controller (CMC), which has no opportunity to operate different ranges of temperatures and voltages in the testbench in a simulated manner. The reason is the unavailability of the real cells in the hardware-in-the-loop (HIL) testbench due to danger related to high voltage. In other words, manipulation of cell data has many restrictions. Furthermore, thermistor temperature sensors (NTC) measure just the room temperature, while different temperature ranges of the cells must be tested. As it is a real device, it cannot be manipulated physically. Filling these gaps leads to more flexibility in testing different scenarios and save on time and costs.

To solve the so-called problems, a technology was selected to emulate the cell management controller. It means, to provide the required cell data, it must communicate with the battery management controller (BMC) following the appropriate serial interface and considering the communication protocol used in the real battery. To reach this purpose, an appropriate technology, which is Arduino, was selected to meet all the requirements to emulate the cell management controller. The system communication was implemented between the cell management controller as the slave and the battery management controller as the master to exchange information regarding the cell data. In the simulated communication the specifications are based on the real one. In this regard, Arduino software was used to simulate the cell management controller and the battery management controller.

As the first step, the battery management controller was simulated to check the functionality of the simulated cell management controller. An appropriate communication in the emulated system as well as exchanging of cell information were the expected results of this research study, which were seen on the connected LCDs as well as Arduino software. To validate the communication, the Arduino was connected to the real battery management controller on the hardware-in-the-loop system. Validation of a part of the function including the initialization of the communication between the real battery management controller and the emulated cell management controller was done successfully. It shows the accuracy of the written codes in the emulated system. As further steps for future works, an adaption of the whole codes to run the remaining functions programmed on the Arduino in relation with the real battery management controller and extension of the number of the cell management controllers are suggested.