A hardware/software codesign for improved data acquisition in a processor based embedded system

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Abstract

Data acquisition plays an important role in processor based real-time embedded systems. The embedded software has to receive the input data from various sensors and take appropriate action depending upon the application. Thus, the process of data acquisition affects the design of the embedded software and also its execution time. In the conventional approach to data acquisition, an input multiplexer is used to route data from different sensors. The selection of the channel in the multiplexer, generation of control signals and data reading is done by the embedded software. The advent of Field Programmable Gate Arrays (FPGAs) has made compact realization of embedded systems possible. As FPGAs are high-density logic devices, it is possible to realize certain software functions in hardware, which can significantly influence hardware/software partitioning of a system. In this article, we shall discuss a hardware/software codesign for data acquisition that is logic intensive to simplify the design of embedded software by transferring certain software functions into hardware. It can be adapted for data acquisition in any application that uses a real-time processor based embedded system.
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