

Codesign for Complex Hard Real-time Embedded Systems

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ABSTRACT

Due to increased system complexity and pressure to reduce development times, the development of long lifetime hard real-time embedded systems is becoming increasingly difficult. This paper presents a hardware-software co design framework of three-phase process. The first phase develops constraints (in terms of time, resource usage etc.) that are placed upon a subsequent system implementation, produces non-functional design decisions using trade-off analysis method between different non-functional properties. Secondly, system functions are generated by use of high-level modeling tools (e.g. UML, Matlab) to increase automation and higher-level abstraction within the development process. Thirdly, low-level implementation performs relatively conventional hardware-software codesign to map the functions onto a platform until meeting the non-functional requirements. The method proposed by this paper takes advantage of increased automation for long-lifetime hard real-time embedded systems, until ensuring system timing predictability and amenability to change.

Keywords: High-level Design; Low-level Implementation; Real-time embedded systems; Codesign; Timing predictability; Constraints