Programming Models and Tools for Intelligent Embedded Systems

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Design automation and analysis tools targeting embedded platforms, developed using a component-based design approach, must be able to reason about the capabilities of the platforms. In the general case where nothing is assumed about the components comprising a platform or the platform topology, analysis must be employed to determine its capabilities. This kind of analysis is the subject of this dissertation. The main contribution of this work is the Service Relation Model used to describe and analyze the flow of service in models of platforms and systems composed of re-usable components. Fundamental to the service relation model is the novel concept of service aggregation that simply states that one service is accessible through another. The usefulness and versatility of the Service Relation Model is demonstrated by means of three different applications. In the first application, the model is used for checking the consistency of a design with respect to the availability of services and resources. In the second application, a tool for automatically implementing the communication infrastructure of a process network application, the Service Relation Model is used for analyzing the capabilities of a platform and as a basis for efficient code generation. In the third application, the Service Relation Model and the concept of consistency are used to guide an automated procedure for designing systems composed of components.

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