Computer systems are embedded in several products that we use on a daily basis. In many cases, these systems have the dedicated purpose of controlling one or several physical processes. The automotive domain is a prominent example of embedded control systems, with ABS, anti spin, and cruise control acting as a few examples of control applications.

Many embedded systems comprise several processing and control units that communicate sensor and actuator signals across a computer network. Execution in such distributed control systems leads to delays that affect the control quality delivered by the system. This thesis proposes methods for optimization of control quality in distributed systems with respect to the delays incurred by common scheduling policies and communication protocols. The proposed solutions integrate techniques for synthesis, scheduling, and optimization of embedded computing system.

Modern embedded systems have to be able to react and adapt to several situations at run-time. Examples of such situations are changes in operational mode, the occurrence of faults in one or several components, and variations in the requested amount of resources. These requirements on adaptivity, as well as requirements on control quality, lead to several interesting optimization problems. The thesis proposes solutions to these problems based on design and run-time techniques for decision making during execution.