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Nota di contenuto	1. Use Cases -- 2. Engineering of Collaborative Embedded Systems -- 3. Architectures for Flexible Collaborative Systems -- 4. Function Modeling for Collaborative Embedded Systems -- 5. Architectures for Dynamically Coupled Systems -- 6. Modeling and Analyzing Context-Sensitive Changes during Runtime -- 7. Handling Uncertainty in Collaborative Embedded Systems Engineering -- 8. Dynamic Safety Certification for Collaborative Embedded Systems at Runtime -- 9. Goal-Based Strategy Exploration -- 10. Creating Trust in Collaborative Embedded Systems -- 11. Language Engineering for Heterogeneous Collaborative Embedded Systems -- 12. Development and Evaluation of Collaborative Systems using Simulation -- 13. Tool Support for Co-Simulation-Based Analysis -- 14. Supporting the Creation of Digital Twins for CESs -- 15. Online Experiment-Driven Learning and Adaption

-- 16. Compositional Verification using Model Checking and Theorem Proving -- 17. Artifact-Based Analysis for the Development of Collaborative Embedded Systems -- 18. Variant and Product Line Co-Evolution -- 19. Advanced Systems Engineering.

Sommario/riassunto

This Open Access book presents the results of the "Collaborative Embedded Systems" (CrEst) project, aimed at adapting and complementing the methodology underlying modeling techniques developed to cope with the challenges of the dynamic structures of collaborative embedded systems (CESs) based on the SPES development methodology. In order to manage the high complexity of the individual systems and the dynamically formed interaction structures at runtime, advanced and powerful development methods are required that extend the current state of the art in the development of embedded systems and cyber-physical systems. The methodological contributions of the project support the effective and efficient development of CESs in dynamic and uncertain contexts, with special emphasis on the reliability and variability of individual systems and the creation of networks of such systems at runtime. The project was funded by the German Federal Ministry of Education and Research (BMBF), and the case studies are therefore selected from areas that are highly relevant for Germany's economy (automotive, industrial production, power generation, and robotics). It also supports the digitalization of complex and transformable industrial plants in the context of the German government's "Industry 4.0" initiative, and the project results provide a solid foundation for implementing the German government's high-tech strategy "Innovations for Germany" in the coming years.
