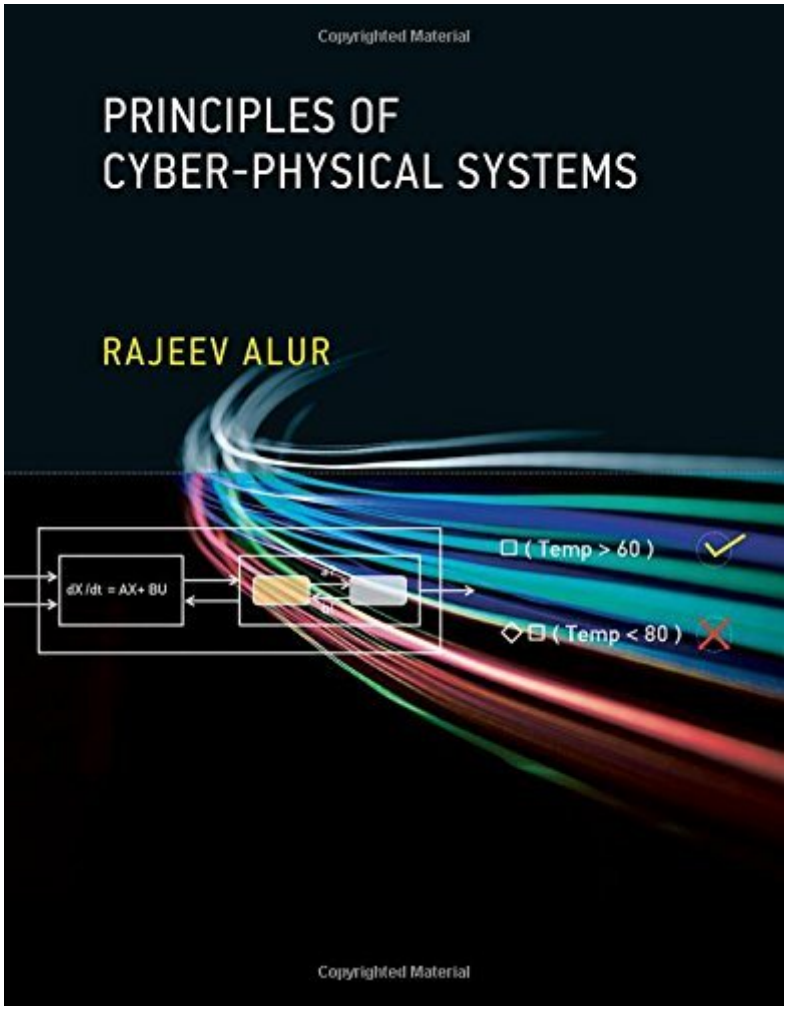
Principles Of Cyber-Physical Systems (MIT Press)



Synopsis

A cyber-physical system consists of a collection of computing devices communicating with one another and interacting with the physical world via sensors and actuators in a feedback loop. Increasingly, such systems are everywhere, from smart buildings to medical devices to automobiles. This textbook offers a rigorous and comprehensive introduction to the principles of design, specification, modeling, and analysis of cyber-physical systems. The book draws on a diverse set of subdisciplines, including model-based design, concurrency theory, distributed algorithms, formal methods of specification and verification, control theory, real-time systems, and hybrid systems, explaining the core ideas from each that are relevant to system design and analysis.The book explains how formal models provide mathematical abstractions to manage the complexity of a system design. It covers both synchronous and asynchronous models for concurrent computation, continuous-time models for dynamical systems, and hybrid systems for integrating discrete and continuous evolution. The role of correctness requirements in the design of reliable systems is illustrated with a range of specification formalisms and the associated techniques for formal verification. The topics include safety and liveness requirements, temporal logic, model checking, deductive verification, stability analysis of linear systems, and real-time scheduling algorithms. Principles of modeling, specification, and analysis are illustrated by constructing solutions to representative design problems from distributed algorithms, network protocols, control design, and robotics.This book provides the rapidly expanding field of cyber-physical systems with a long-needed foundational text by an established authority. It is suitable for classroom use or as a reference for professionals.

Book Information

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Customer Reviews

This is a great intro for aero/mechanical engineers exploring cyber physical systems design. I've struggled with many texts on this topic being too computer science heavy, and feeling lost in the jargon. As an aero controls engineer, this text really helped get me up to speed.

This is a wonderful book!The book presents a treatment of cyber-physical systems (often called embedded systems) at a well-chosen level of abstraction that permits theoretical treatment yet supports practical implementation.It is perhaps the most clearly written technical work I have ever read. The reader is never in doubt about what Professor Alur means.To get a good idea of the contents of the book, read the Introduction, available under First Pages at the page.I was attracted to the book because of the foundational work Prof. Alur has done on timed automata.

Good book which brings together topics from various domains(Automata, Controls Systems, Dynamics) etc.

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