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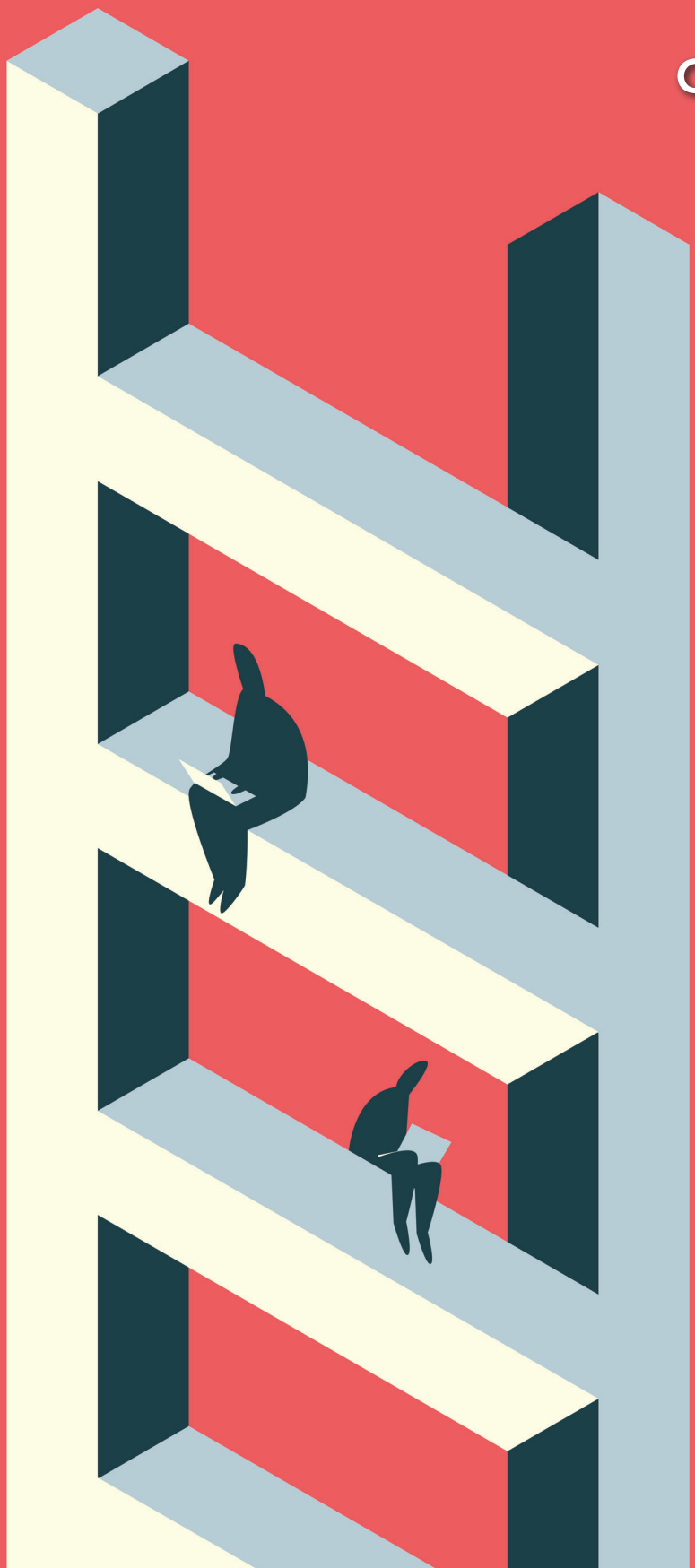

Quantum Computing for First-Time Learners

An AI Useless Case: A Need for Curricular Cultural Computing Literacy

From Principle to Practice: A Culturally Responsive Toolkit for the Busy CS Teacher

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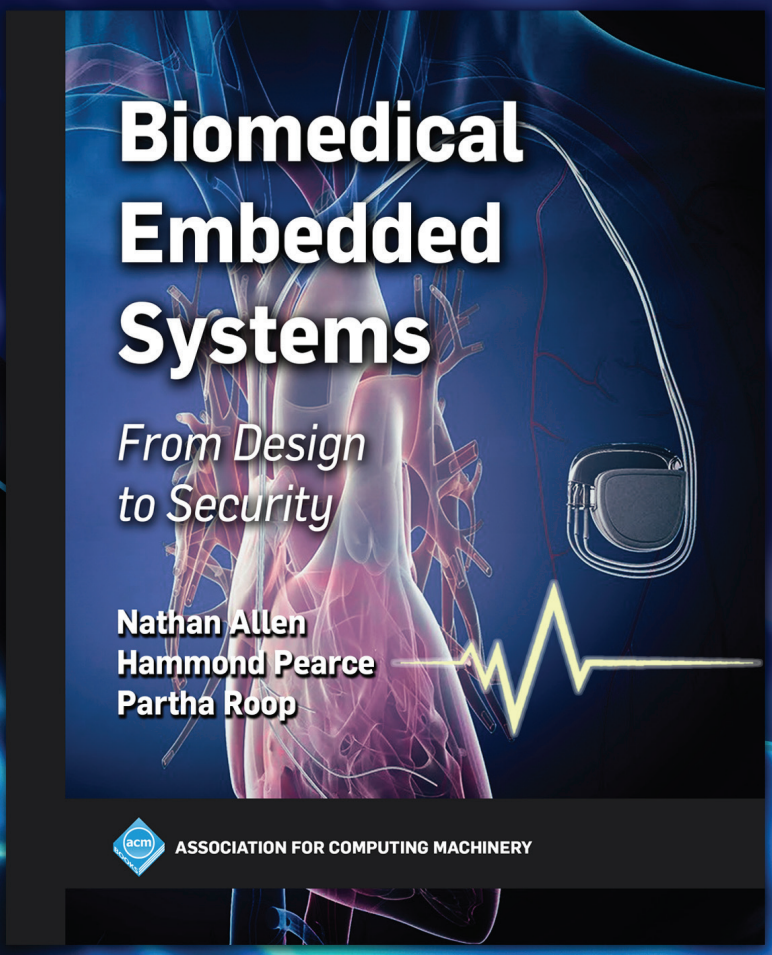

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Collection III

Biomedical Embedded Systems

From Design to Security

Nathan Allen
Hammond Pearce
Partha Roop

ISBN: 979-8-4007-3155-6
DOI: 10.1145/3731217

Through a detailed case study of a pacemaker and a modeled human heart, this book demonstrates how the synchronous approach enables accurate modeling, verification, and automated code generation. Using the SCCharts language, readers learn how to model the cardiac conduction system and a DDD-mode pacemaker, derive embedded implementations, and validate them via a synchronous heart simulator.

Biomedical systems—such as pacemakers and automated insulin pumps—are Cyber-Physical Systems (CPSs) that must operate safely and reliably at all times. This book introduces a systematic design methodology for Medical CPSs (MCPSs) using the synchronous approach, which ensures deterministic and reactive execution—key to safety-critical performance.

The book then covers formal verification using the UPPAAL model checker, followed by run-time verification methods that form the foundation for preventing adversarial attacks. It concludes with references to open-source tools and future research directions relevant to the CPS community.

This is a clear, practical guide to designing safe and verifiable medical cyber-physical systems.

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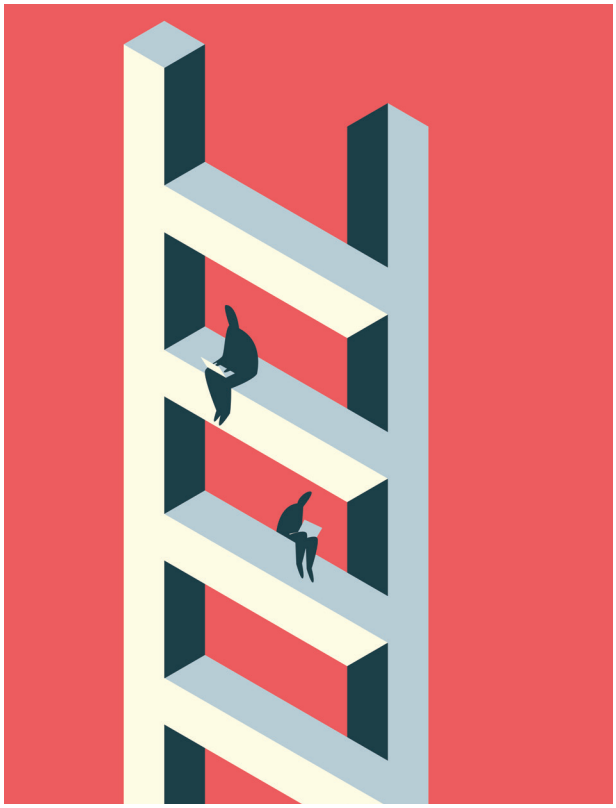

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ON THE COVER Quantum physics is often considered the domain of paradox and enigmas. Our cover, with its Möbius strip reference, visually captures some of this mystery, which is happily demystified in this issue's cover story.

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