

Shubu Mukherjee

ARCHITECTURE DESIGN FOR SOFT ERRORS

Architecture Design For Soft Errors Architecture Design For Soft Errors

Jean-Luc Autran, Daniela Munteanu



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Architecture Design for Soft Errors Shubu Mukherjee, 2008 This book provides a comprehensive description of the architectural techniques to tackle the soft error problem. It covers the new methodologies for quantitative analysis of soft errors as well as novel cost effective architectural techniques to mitigate them. To provide readers with a better grasp of the broader problem definition and solution space, this book also delves into the physics of soft errors and reviews current circuit and software mitigation techniques. TABLE OF CONTENTS Chapter 1 Introduction Chapter 2 Device and Circuit Level Modeling Measurement and Mitigation Chapter 3 Architectural Vulnerability Analysis Chapter 4 Advanced Architectural Vulnerability Analysis Chapter 5 Error Coding Techniques Chapter 6 Fault Detection via Redundant Execution Chapter 7 Hardware Error Recovery Chapter 8 Software Detection and Recovery Provides the methodologies necessary to quantify the effect of radiation induced soft errors as well as state of the art techniques to protect against them **Architecture Design for Soft Errors** Shubu Mukherjee, 2011-08-29 Architecture Design for Soft Errors provides a comprehensive description of the architectural techniques to tackle the soft error problem. It covers the new methodologies for quantitative analysis of soft errors as well as novel cost effective architectural techniques to mitigate them. To provide readers with a better grasp of the broader problem definition and solution space, this book also delves into the physics of soft errors and reviews current circuit and software mitigation techniques. There are a number of different ways this book can be read or used in a course as a complete course on architecture design for soft errors covering the entire book, a short course on architecture design for soft errors and as a reference book on classical fault tolerant machines. This book is recommended for practitioners in semiconductor industry, researchers and developers in computer architecture, advanced graduate seminar courses on soft errors and iv as a reference book for undergraduate courses in computer architecture. Helps readers build in fault tolerance to the billions of microchips produced each year, all of which are subject to soft errors. Shows readers how to quantify their soft error reliability. Provides state of the art techniques to protect against soft errors Soft Errors Jean-Luc Autran, Daniela Munteanu, 2017-12-19 Soft errors are a multifaceted issue at the crossroads of applied physics and engineering sciences. Soft errors are by nature multiscale and multiphysics problems that combine not only nuclear and semiconductor physics, material sciences, circuit design and chip architecture and operation but also cosmic ray physics, natural radioactivity, issues, particle detection and related instrumentation. Soft Errors From Particles to Circuits addresses the problem of soft errors in digital integrated circuits subjected to the terrestrial natural radiation environment, one of the most important primary limits for modern digital electronic reliability. Covering the fundamentals of soft errors as well as engineering considerations and technological aspects, this robust text discusses the basics of the natural radiation environment, particle interactions with matter and soft error mechanisms. Details instrumentation developments in the fields of environment characterization, particle detection and real time and accelerated tests. Describes the latest computational developments, modeling and

simulation strategies for the soft error rate estimation in digital circuits Explores trends for future technological nodes and emerging devices **Soft Errors From Particles to Circuits** presents the state of the art of this complex subject providing comprehensive knowledge of the complete chain of the physics of soft errors The book makes an ideal text for introductory graduate level courses offers academic researchers a specialized overview and serves as a practical guide for semiconductor industry engineers or application engineers

Soft Errors in Modern Electronic Systems Michael Nicolaidis,2010-09-24 This book provides a comprehensive presentation of the most advanced research results and technological developments enabling understanding qualifying and mitigating the soft errors effect in advanced electronics including the fundamental physical mechanisms of radiation induced soft errors the various steps that lead to a system failure the modelling and simulation of soft error at various levels including physical electrical netlist event driven RTL and system level modelling and simulation hardware fault injection accelerated radiation testing and natural environment testing soft error oriented test structures process level device level cell level circuit level architectural level software level and system level soft error mitigation techniques The book contains a comprehensive presentation of most recent advances on understanding qualifying and mitigating the soft error effect in advanced electronic systems presented by academia and industry experts in reliability fault tolerance EDA processor SoC and system design and in particular experts from industries that have faced the soft error impact in terms of product reliability and related business issues and were in the forefront of the countermeasures taken by these companies at multiple levels in order to mitigate the soft error effects at a cost acceptable for commercial products In a fast moving field where the impact on ground level electronics is very recent and its severity is steadily increasing at each new process node impacting one after another various industry sectors as an example the Automotive Electronics Council comes to publish qualification requirements on soft errors research and technology developments and industrial practices have evolve very fast outdated the most recent books edited at 2004

Soft Error Reliability Using Virtual Platforms Felipe Rocha da Rosa,Luciano Ost,Ricardo Reis,2020-11-02 This book describes the benefits and drawbacks inherent in the use of virtual platforms VPs to perform fast and early soft error assessment of multicore systems The authors show that VPs provide engineers with appropriate means to investigate new and more efficient fault injection and mitigation techniques Coverage also includes the use of machine learning techniques e g linear regression to speed up the soft error evaluation process by pinpointing parameters e g architectural with the most substantial impact on the software stack dependability This book provides valuable information and insight through more than 3 million individual scenarios and 2 million simulation hours Further this book explores machine learning techniques usage to navigate large fault injection datasets

Energy-Efficient Fault-Tolerant Systems Jimson Mathew,Rishad A. Shafik,Dhiraj K. Pradhan,2013-09-07 This book describes the state of the art in energy efficient fault tolerant embedded systems It covers the entire product lifecycle of electronic systems design analysis and testing and includes discussion of both circuit and system level approaches Readers

will be enabled to meet the conflicting design objectives of energy efficiency and fault tolerance for reliability given the up to date techniques presented **Hardware and Software: Verification and Testing** Roderick Bloem,Eli Arbel,2016-10-31

This book constitutes the refereed proceedings of the 12th International Haifa Verification Conference HVC 2016 held in Haifa Israel in November 2016 The 13 revised full papers and one tool paper presented were carefully reviewed and selected from 26 submissions They are dedicated to advance the state of the art and state of the practice in verification and testing and are discussing future directions of testing and verification for hardware software and complex hybrid systems **VLSI**

Tomasz Wojcicki,2017-12-19 Recently the world celebrated the 60th anniversary of the invention of the first transistor The first integrated circuit IC was built a decade later with the first microprocessor designed in the early 1970s Today ICs are a part of nearly every aspect of our daily lives They help us live longer and more comfortably and do more faster All this is possible because of the relentless search for new materials circuit designs and ideas happening on a daily basis at industrial and academic institutions around the globe Showcasing the latest advances in very large scale integrated VLSI circuits VLSI Circuits for Emerging Applications provides a balanced view of industrial and academic developments beyond silicon and complementary metal oxide semiconductor CMOS technology From quantum dot cellular automata QCA to chips for cochlear implants this must have resource Investigates the trend of combining multiple cores in a single chip to boost performance of the overall system Describes a novel approach to enable physically unclonable functions PUFs using intrinsic features of a VLSI chip Examines the VLSI implementations of major symmetric and asymmetric key cryptographic algorithms hash functions and digital signatures Discusses nonvolatile memories such as resistive random access memory Re RAM magneto resistive RAM MRAM and floating body RAM FB RAM Explores organic transistors soft errors photonics nanoelectromechanical NEM relays reversible computation bioinformatics asynchronous logic and more VLSI Circuits for Emerging Applications presents cutting edge research design architectures materials and uses for VLSI circuits offering valuable insight into the current state of the art of micro and nanoelectronics **Nanotechnology: Concepts,**

Methodologies, Tools, and Applications Management Association, Information Resources,2014-02-28 Over the past few decades devices and technologies have been significantly miniaturized from one generation to the next providing far more potential in a much smaller package The smallest of these recently developed tools are miniscule enough to be invisible to the naked eye Nanotechnology Concepts Methodologies Tools and Applications describes some of the latest advances in microscopic technologies in fields as diverse as biochemistry materials science medicine and electronics Through its investigation of theories applications and new developments in the nanotechnology field this impressive reference source will serve as a valuable tool for researchers engineers academics and students alike **Dependable Embedded Systems** Jörg Henkel,Nikil Dutt,2020-12-09 This Open Access book introduces readers to many new techniques for enhancing and optimizing reliability in embedded systems which have emerged particularly within the last five years This book introduces

the most prominent reliability concerns from today's points of view and roughly recapitulates the progress in the community so far. Unlike other books that focus on a single abstraction level such as circuit level or system level alone, the focus of this book is to deal with the different reliability challenges across different levels starting from the physical level all the way to the system level cross layer approaches. The book aims at demonstrating how new hardware software co design solution can be proposed to effectively mitigate reliability degradation such as transistor aging, processor variation, temperature effects, soft errors etc. Provides readers with latest insights into novel cross layer methods and models with respect to dependability of embedded systems. Describes cross layer approaches that can leverage reliability through techniques that are proactively designed with respect to techniques at other layers. Explains run time adaptation and concepts means of self organization in order to achieve error resiliency in complex future many core systems.

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web it is run by a fellow teacher and has materials for all of the stories for harcourt 2nd grade i also use a lot of her resources in my classroom johnny appleseed kid s page