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Tim Kelley examines the framed cover of his new SIAM book, a gift that's presented to all SIAM authors when their works are published.

Tim Kelley talks about math, SIAM, and his newest book

Tim Kelley recently published *Implicit Filtering*, his fourth book with SIAM. Tim talked with us about his career and the important role that SIAM has played in it, as well as other interesting topics.

Why did you decide to pursue a career in math?

Most mathematicians know that they're going to be mathematicians when they're kids. For me, it was math or the NFL. Football didn't work out so I went into math.

Who were your major influences?

There are way too many to name but a few come to mind. I went to graduate school at Purdue. My advisor Tom Mullikin converted me from a pure to an applied mathematician. As an undergrad, I studied analytic number theory. I thought I'd do complex analysis in grad school but Tom straightened me out. I wrote my thesis on integral equations as applied to neutron transport theory. This thesis topic let me use a lot of the pure mathematics I knew, so I could get out of grad school fast. I was in Lafayette, Indiana, so rapid graduation was important to me. I did meet my wife at Purdue so my time in Lafayette was well spent.

After grad school, Herb Keller and John Dennis went out of their way to help me and made a huge difference in my career. Most of what I've done in nonlinear solvers and optimization are thanks to them.

Why did you write Implicit Filtering?

We've been developing the software for over 10 years for various applications. This is the second version. The first version was in Fortran. The software is mature enough so we thought it was time to get it out in a well-documented manner, and SIAM's Software, Environments, and Tools series is the perfect place.

What does SIAM mean to you?

I went to my first SIAM meeting when I was a post-doc. All I remember was that it was a Midwest Regional Meeting in the fall. It was the first math meeting where I felt completely at home. Without SIAM I wouldn't have much of a career. I've published many of my papers in SIAM journals and all four of my books. The SIAM staff is great to work with.

SIAM has given me opportunities to do many things. I've served on the editorial board of SINUM and I was editor-in-chief of SIOPT and SIREV. I've been on the board and council. And, most importantly, I've gotten to be on a Join SIAM poster.

How did you become a Kentucky Colonel?

The standards are high. You have to know someone—in my case it was my father, who was active in the Chamber of Commerce in the town where I grew up in Kentucky. Dad probably earned it. One Christmas, my father made his children Kentucky Colonels. I have no duties. I give them $25 a year. They invite me to a derby party. I don't go. It has nothing to do with chicken.

Tim, his students, and his favorite fowl (on table in front of Tim, with students holding miniatures).

Then why do you have a chicken in your office?

The chicken is made of concrete. It's a professional souvenir—a gift from an ARO program officer who dared me to accept it. Every Kentucky Colonel should have a chicken.

C. T. Kelley is a Drexel Professor of Mathematics at North Carolina State University, where he has been on the faculty since 1978. He is the author of four books and over 100 papers and has mentored 18 PhD students. He has served as editor-in-chief of SIAM Journal on Optimization, SIAM Vice President for Publications, and on the SIAM Council. He is presently editor-in-chief of SIAM Review and serves on the SIAM Board of Trustees. Tim is one of only two people to have served as editor-in-chief of two SIAM journals, the other being Gene Golub. He is a Fellow of SIAM and a member of the American Geophysical Union, the Mathematical Optimization Society, INFORMS, AWM, and the Honorable Order of Kentucky Colonels.

Implicit Filtering

C. T. Kelley

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Implicit filtering is a way to solve bound-constrained optimization problems for which derivative information is not available. Unlike methods that use interpolation to reconstruct the function and its higher derivatives, implicit filtering builds upon coordinate search and then interpolates to get an approximation of the gradient.

The author describes the algorithm, its convergence theory, and a new MATLAB® implementation, and includes three case studies. This book is unique in that it is the only one in the area of derivative-free or sampling methods and is accompanied by publicly available software. It is also designed as a software manual and as a reference for implicit filtering—one can approach the book as a consumer of the software, as a student, or as a researcher in sampling and derivative-free methods. The book includes a chapter on convergence theory that is both accessible to students and an overview of recent results on optimization of noisy functions, including results that depend on non-smooth analysis and results on the handling of constraints.

This book is intended for students who want to learn about this technology, scientists and engineers who would like to apply the methods to real-world problems, and specialists who will use the ideas and software from this book in their own research.

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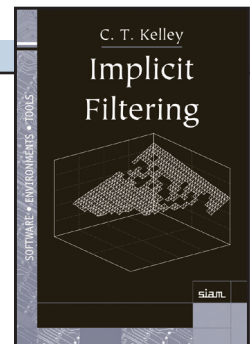
New from SIAM

The Art of Differentiating Computer Programs:
An Introduction to Algorithmic Differentiation
Uwe Naumann

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This is the first entry-level book on algorithmic (also known as automatic) differentiation, providing fundamental rules for the generation of first- and higher-order tangent-linear and adjoint code. The author covers the mathematical underpinnings as well as how to apply these observations to real-world numerical simulation programs. Readers will find many examples and exercises, including hints to solutions.

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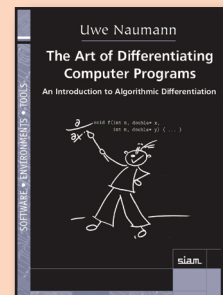
Numerical Solution of Algebraic Riccati Equations
Dario A. Bini, Bruno Iannazzo, and Beatrice Meini

Fundamentals of Algorithms 9

This concise and comprehensive treatment of the basic theory of algebraic Riccati equations describes the classical as well as the more advanced algorithms for their solution in a manner that is accessible to both practitioners and scholars. It is the first book in which nonsymmetric algebraic Riccati equations are treated in a clear and systematic way. Readers will find a detailed description of all classical and advanced algorithms for solving algebraic Riccati equations, along with their MATLAB® codes.

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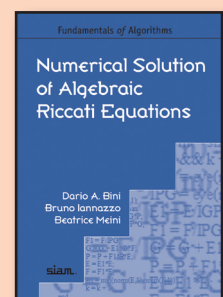
Computational Optimization of Systems Governed by Partial Differential Equations
Alfio Borzì and Volker Schulz

Computational Science and Engineering 8

This book fills a gap between theory-oriented investigations in PDE-constrained optimization and the practical demands made by numerical solutions of PDE optimization problems. The authors discuss computational techniques representing recent developments that result from a combination of modern techniques for the numerical solution of PDEs and for sophisticated optimization schemes. The book provides a bridge between continuous optimization and PDE modeling and focuses on the numerical solution of the corresponding problems.

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