

A Commercial Program Synthesis System for Computational Finance

— Invited Talk —

Elaine Kant
SciComp Inc.

Abstract.

Program synthesis is the underlying technology for SciComp's SciFinance suite of products for the financial risk management market. SciFinance automates the generation of mathematical modeling codes that price derivative products, and investment banks use it for research pricing, production pricing, and risk control. The extensible Algorithm SPECification Notation (ASPEN) combines application-specific constructions, mathematical expressions (focusing on systems of partial differential equations and stochastic differential equations), and optional algorithm design recommendations. The generated C code is approximately 50-100 times the length of the specification.

SciFinance is a knowledge-intensive system that integrates object representations with refinement and optimization rules, planning, and symbolic computer algebra. Its object representations include abstract templates for state-of-the-art numerical algorithms, and its rules incorporate equations of any dimensionality and conditional expressions into the algorithms to produce highly optimized code with data structures customized to the specific mathematics of the specification. The financial system is layered on a generic system for generating scientific computing codes in target languages such as C, Fortran, or Fortran90.

A commercial product since 1999, SciFinance has been licensed to major US and European investment banks (e.g., Merrill Lynch, Bank of America, ABN AMRO). Their quantitative analysts, who would otherwise write the programs manually or combine existing components, can instead focus instead on financial model analysis, description, and validation. The analysts generally know nothing about SciFinance's underlying technology and treat it as a super-intelligent compiler that helps them produce in days codes that previously took weeks or were not attempted.

Biography.

Dr. Elaine Kant is the founder and president of SciComp Inc., a technology company that uses software synthesis to develop financial modeling software and other scientific computing software. Elaine received her undergraduate degree in Mathematics from M.I.T. and her Ph.D. in Computer Science from Stanford University. Before founding SciComp, she taught computer science at Carnegie-Mellon University and worked at Schlumberger in several computer science research groups. Elaine is a Fellow of both the American Association of Artificial Intelligence and the American Association for the Advancement of Science. She has written numerous books, chapters, and technical papers on software synthesis, understanding and automating algorithm design, and scientific computing environments.