The Colorado State University Computer Science Department presents:

Extreme Computing: The SIAM 100-Digit Challenge

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Abstract

A few years ago, a prominent numberical analyst challenged the community with a contest consisting of ten difficult computation problems, the idea being to get 10 digits of the answers to each. Enthusiasts around the world submitted solutions and 20 teams got perfect scores of 100. The solutions to these problems involve many surprising and elegant techniques, and this talk will survey the diverse methods used. Intriguing followup points were: Can one prove that the results are correct? Can one get, say, 10000 digits as opposed to only 10 for each problem? The answers to both of these are YES for the majority of the problems. Sample questions:

- What is the smallest value of the function:

  $sin(60\ e^y) + sin(70\ sin\ x) + sin(sin(80\ y)) - sin(10(x+y)) + e^{sin(50x)} + 1/4(x^2+y^2)$?

- A particle at the center of a 10×1 rectangle undergoes Brownian motion (a 2-dimensional random walk with infinitesimal step length) till it hits the boundary. What is the probability that it hits at one of the ends rather than at one of the sides?

Several unusual methods can be brought to bear on these problems, such as: the Chinese Remainder Theorem to deal with a 20000×20000 matrix, interval arithmetic to obtain proofs of correctness and algorithms for optimization; unusual heuristics for a difficult optimization problem.

Biography

Stan Wagon, professor of mathematics at Macalester College, grew up in Montreal and obtained his PhD at Dartmouth College. His current mathematical interest is the use of computing to bring abstract concepts to life. He has written 11 books and 100 papers, and has appeared in *Ripley's Believe It Or Not* for his construction of a working square-wheeled bicycle. He has won several prizes for writing and shared the first-place prize in the SIAM 100-Digit Challenge. Other interests include ultramarathoning (founding editor of *Ultrarunning Magazine*), ski mountaineering (led a group attempting a ski ascent of Mount Logan, Canada's highest peak at 19500 feet), nordic ski racing (completed a 100-mile race), and competitive snow sculpture, where his team uses geometrical themes and has won three silver medals in international competition.