Editorial

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Biographical notes: Anthony Harkin is an Associate Professor in the School of Mathematical Sciences at the Rochester Institute of Technology and Director of the RIT Center for Applied and Computational Mathematics. He received his PhD in Mathematics from Boston University. His primary research interests are nonlinear dynamics of fluid interfaces and developing techniques for detecting community structure in large networks.

Jae-Hun Jung is an Assistant Professor in the Department of Mathematics at the University at Buffalo, the State University of New York. He holds a PhD in Applied Mathematics from Brown University. His research is in the areas of numerical analysis and scientific computing, particularly high-order methods for hyperbolic problems.

Herb Kunze is a Professor in the Department of Mathematics and Statistics at the University of Guelph. He holds a PhD in Applied Mathematics from the University of Waterloo. His main research interests are applied analysis, fractal-based methods in analysis, dynamical systems, and qualitative theory of differential equations.

Fengyan Li is an Associate Professor in the Department of Mathematical Sciences at Rensselaer Polytechnic Institute. She received her PhD in Applied Mathematics from Brown University. Her research interests are in design and analysis of numerical methods, often of high order accuracy, for differential equations in physics and engineering applications.

This special issue presents research papers from participants at the Third New York Conference on Applied Mathematics (NYCAM), held at Rensselaer Polytechnic Institute on October 13, 2012.

The first NYCAM was held at Rochester Institute of Technology on October 17, 2009, and the second NYCAM was held at SUNY Buffalo on April 30, 2011. The conference aims to bring together researchers from New York State, the province of Ontario, and the Northeastern USA who are working in diverse branches of applied and computational mathematics. The format of the one-day conference features talks from university faculty and students, and from researchers working in industry and government. A primary intent of the conference is to strengthen ties between applied mathematicians/scientists working in the region.

The third NYCAM saw more than 70 delegates from over 20 different institutions and organisations participate in a common morning session and an afternoon of five parallel sessions. The wide range of research topics presented made it possible for conference participants to re-imagine where the field of applied mathematics is going.

In this issue, we highlight some of the research presented at the third NYCAM.

J. Buli, J-H. Jung and D. Chakraborty computed the late-time power-law decay behaviour of the gravitational wave from the black-hole system by solving the second order wave equation with the first order exact radiation boundary condition. They showed that if the computational truncation is too small, i.e., close to the horizon size, the first order formulation for the boundary condition does not yield a proper power-law decay. Instead, it is discussed that more consistent approaches, such as using a system equation, or a high-order, higher precision approach are desired.

K.M. Levere presents an inverse problem for a hyperbolic partial differential equation that models the Gao beam, a nonlinear beam model that incorporates the possibility of buckling of a beam under a load. The author explores an inverse problem that seeks the flexural rigidity of the beam, presents and discusses the results. The solution method uses a 'collage coding' approach, in which one seeks to minimise a functional arising from the Lax-Milgram representation theorem. An inverse problem that seeks to estimate the flexural rigidity of the beam is explored to illustrate the goodness of the method.

Y. Li and W. Ji give a theoretical analysis of the convergence of a heuristic collective sphere packing algorithm and discuss the impact of algorithm step size on the convergence. Computer simulation of random sphere packing is important for the study of densely packed particulate systems. The authors obtain and analyse the upper limit of the step size for convergence and the criteria for step size selection when an active boundary constraint is imposed. While the analyses focus on systems packed with mono-dispersed spheres, the mathematical method and analysis extends to the setting of poly-dispersed sphere systems.

Q. Ye discusses a new method for approximating high-dimensional nonlinear stochastic partial differential equations (SPDEs). The approach uses a kernel-based collocation method that is mesh-free. The kernel-based collocation solution is a linear combination of the reproducing kernel with the differential and boundary operators of SPDEs at the given collocation points placed in the related high-dimensional domains. The authors compute expansion coefficients using a random optimisation problem with constraint conditions, induced by the nonlinear SPDEs. Interestingly, the authors establish that the convergence of the kernel-based collocation solutions only depends on the fill distance of the chosen collocation points for the bounded domain of SPDEs. Numerical experiments are presented to illustrate the method.

The guest editors would like to thank all of the authors, as well as all others who submitted papers for consideration.