

2011
Bluenose
Computational and Applied Math Day
Saint Mary's University, June 17, 2011

Description of Event

The eleventh in the sequence of one day meetings of researchers interested in computational and applied mathematics was held at Saint Mary's University, on Friday, June 17, 2011. The previous meetings were held in 2000 at Acadia University, 2001 at Saint Mary's University, 2002 at Dalhousie University, 2003 at Saint Mary's University, 2004 at Acadia University, 2005 at Cape Breton University, 2006 at St. Francis Xavier University ,2007 at Saint Mary's University, 2008 at Dalhousie University, 2009 at Acadia University.

Research in many disciplines within science and engineering relies upon mathematical modelling as a key component of the investigative process. Examples of areas where numerical modelling plays a significant role include mathematics of finance, weather forecasting, mathematical biology, computational geophysics, computer graphics, and computational astronomy. It is often expensive, impractical, or in many cases, e.g., analysis of financial markets, geophysics, or astronomy, impossible to set up and perform physical experiments, and thus mathematical/computational modelling must play a central role. While sophisticated applications-based models can lend substantial insight, it is usually the case that these models must be treated with a combination of classical applied mathematics techniques and computer-software-based approaches for the determination of accurate approximate solutions of these models.

In addition to a large number of researchers in science and engineering who use computer models in their research, the Atlantic region also includes many researchers who specialize in the related areas of applied mathematics and numerical analysis. With the current trend by researchers towards increased specialization, a significant challenge in contemporary research efforts involving mathematical modelling is to encourage interaction between application-domain experts who develop the sophisticated mathe-

matical models and applied mathematicians and numerical analysts who can provide expertise on available mathematical analytic techniques and numerical algorithms.

The event consisted of 13 talks – 6 given by faculty and 7 by students. We had the pleasure of hosting 3 visitors/speakers from the United States: Dr. Weizhang Huang (Kansas), Dr. David Uminsky (UCLA) and a graduate student Hui Sun (UCLA). The meeting also featured a talk by graduate student Tom Arsenault who is with the Financial Mathematics group at the University of Western Ontario. The remaining talks were given by faculty and student researchers from the Atlantic region. The speakers included students Amanda Swan (Acadia), Alex Howse (Memorial), Zhi Li (Saint Mary's), Chris Levy (Dalhousie), and Zahangir Hossain (Memorial), and faculty George Chen (Cape Breton), Ron Haynes (Memorial), David Iron (Dalhousie) and Theodore Kolokolnikov (Dalhousie).

Attendance

The event was well attended. The number of attendees varied but we estimate that 30 to 40 people were in attendance at various points throughout the day. The majority of attendees were from the region including 3 attendees from Newfoundland. And in addition, as mentioned previously, we had one speaker from Ontario and three international speakers.

Scientific Highlights

The plenary talks (Huang and Uminksy) were of exceptional quality. Huang, an international expert in adaptive methods for the numerical solution of partial differential equations, shared his recent results on mesh adaptation for anisotropic diffusion problems. Uminksy discussed the computational efficiency and spatial accuracy of deforming vortex methods for 2D Viscous fluid problems. The third international speaker, Sun, considered mathematical modelling of particle interactions arising in diverse physical systems ranging from insect swarms to the selfassembly of nanoparticles. The students (undergraduate and graduate) gave great talks and hopefully benefited from the experience of sharing their results. Arsenault provided a review of current research in quantitative finance. Swan discussed a mathematical model

of power output for tidal turbines. Howse considered domain decomposition methods for the parallel treatment of boundary value problems. Li described software for the numerical solution of two-dimensional parabolic partial differential equations. Levy presented his work on mathematical modelling of intracellular signalling molecules. Hossain considered the question of mathematical modelling of thermally forced flow; such flow arises in sea-breeze or heat-island circulation, convective current in the earth's mantle, and nuclear reactor insulation. The program was rounded out with talks by a number of regional faculty. Chen spoke on moving mesh methods for blowup problems. Haynes discussed his recent work in the use of domain decomposition for the treatment of differential equations associated with the use of the equidistribution principle for grid generation. Iron gave an interesting talk in the area of mathematical biology involving the investigation of pattern formation in reaction diffusion systems. Kolokolnikov discussed instability thresholds for a cross-diffusion model and for a crime model.

Uminsky stayed in the region for a few days to work with researchers in the Halifax area. Huang was visiting the Saint John's region, participating as a lecturer in the AARMS summer school program during the month of June.

The website for the meeting is posted at
http://cs.smu.ca/~muir/Bluenose2011_Website/welcome.html

Income and Expenditures

Refreshment breaks were funded by the Department of Mathematics and Computing Science, Saint Mary's University. The cost for each coffee break was \$113.85, for a total of \$227.70.

The funding for travel costs for a number of the speakers was provided by a grant from AARMS (max. \$5,000). Travel costs were as follows: Uminsky (\$973.40), Huang (\$371.59), Swan (\$83.97), Arsenault (\$146.50), Hossain (\$358.76), Howse (\$340.96), Haynes (\$519.06), and Chen (\$410.38), for a total of \$3204.62.