THE MS2DISCOVERY INTERDISCIPLINARY RESEARCH INSTITUTE

WATERLOO | CANADA

Simulations of fluid pulses in an artificial artery with active walls

Dmitry Strunin | University of Southern Queensland, Australia

We present numerical solutions of the semi-empirical model of self-propagating fluid pulses (auto-pulses) through the channel simulating an artificial artery. The key mechanism behind the model is the active motion of the walls in line with the earlier model of Roberts. Our model is autonomous, nonlinear and is based on the partial differential equation describing the displacement of the wall in time and along the channel. A theoretical plane configuration is adopted for the walls at rest. For solving the equation we used the One-dimensional Integrated Radial Basis Function Network (1D-IRBFN) method. We demonstrated that different initial conditions always lead to the settling of pulse trains where an individual pulse has certain speed and amplitude controlled by the governing equation. A variety of pulse solutions is obtained using homogeneous and periodic boundary conditions. The dynamics of one, two and three pulses per period are explored. The fluid mass flux due to the pulses is calculated.

Dmitry Strunin is an Associate Professor at the University of Southern Queensland, Australia, affiliated with the Computational Engineering and Science Research Centre and the Faculty of Health, Engineering and Sciences. His research interests are in nonlinear dynamics, active dissipative systems and continuum mechanics. He graduated from the Institute of Physics and Technology, Moscow, Russia, and received his PhD in 1989 from the Institute of Oceanology of the Russian Academy of Sciences, Moscow. After taking a postdoc position at the University of Melbourne, Australia, he worked as a researcher at the University of Wollongong and University of Southern Queensland (USQ) before becoming a lecturer at the USQ in 2002. Dmitry Strunin, jointly with Prof. Anthony Roberts, received two Discovery Project grants (three-year each) from the Australian Research Council (analogy to NSF). He was an invited guest scientist at the Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, and Schmidt Institute of Physics of the Earth of the Russian Academy of Sciences, Moscow. He acted as Associate Editor for the Australian and New Zealand Industrial and Applied Mathematics Journal; is a member of Editorial Board for Multiphysics Modelling (CRC Press, Taylor and Francis group).

Contact at the MS2Discovery Research Institute: Roderick Melnik (Host of the speaker, Tectons 2, 3, 4)

Refreshments will be provided

November 28, 2017

2:30pm | Location: LH3058

The MS2Discovery Seminar Series: www.ms2discovery.wlu.ca/seminar
Wilfrid Laurier University, 75 University Avenue West, Waterloo

This event is hosted by the MS2Discovery Interdisciplinary Research Institute
http://www.ms2discovery.wlu.ca | Waterloo

INTERDISCIPLINARY MS2DISCOVERY RESEARCH INSTITUTE

FIELDS

SHARCNET™

nano ontario

SOSCIP SOUTHERN ONTARIO SMART COMPUTING INNOVATION PLATFORM

LAURIER Inspiring Lives.

fφssa

compute • calcul CANADA