NORTH ATLANTIC UNIVERSITY UNION

Editors: N. Mastorakis, V. Mladenov, Z. Bojkovic

# Latest Trends on Applied Mathematics, Simulation, Modelling

4th International Conference on Applied Mathematics, Simulation, Modelling (ASM'10)

Corfu Island, Greece, July 22-25, 2010

ISSN: 1792-4332
ISBN: 978-960-474-210-3

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See also: http://www.worldses.org/review/index.html

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## Plenary Lecture 1

# Radial Basis Funcions Interpolation and Applications - An Incremental Approach

**Professor Vaclav Skala**
University of West Bohemia
Computer Science Department
Center of Computer Graphics and Visualization
Czech Republic
E-mail: skala@kiv.zcu.cz

**Abstract:** Interpolation techniques on structured data sets are well known and used. There are many technical and non-technical applications when interpolation of scalar values, e.g. a potential fields, or vector data on unstructured ddata sets are needed. Radial Basis Functions (RBF) offer smooth data interpolation generally in n-dimensional space. RBF interpolation is especially convenient for applications with scattered data.
We will present standard RBF interpolation techniques and new incremental approach with significantly lower computational complexity.

**Brief Biography of the Speaker:**
Prof. Vaclav Skala is a professor at the University of West Bohemia, Plzen (Pilsen) and at the Ostrava University, Ostrava, Czech Republic. He is currently head of the Center of Computer Graphics and Visualization (http://Graphics.zcu.cz). His research fields are: Computer Graphics, Visualization, Geometric Algebra, Algorithms and data Structures.
He is a member of the The Visual Computer (Springer), Computers&Graphics (Elsevier) editorial boards, member of IEEE, ACM-SIGGRAPH and Eurographics Association. He is the Editor-in-Chief of the Journal of WSCG and organiser of WSCG (http://wscg.zcu.cz) and GraVisMa (http://GraVisMa.zcu.cz) conferences in Czech Republic.

## Plenary Lecture 2

# The Role of Mathematics in the Study of Structural and Functional Brain Connectivity

**Professor Arvid Lundervold**
Department of Biomedicine & Molecular Imaging Center, University of Bergen
also with:
Department of Radiology, Haukeland University Hospital
Bergen, Norway
E-mail: arvid.lundervold@biomed.uib.no

**Abstract:** The advances in non-invasive brain imaging technologies have enabled new insights into the structural wiring and functional connectivity of the living human brain - in both health and disease. These technologies include high resolution 3D magnetic resonance imaging (MRI), MR diffusion tensor imaging (DTI), functional MRI, as well as image processing and data analysis methods (e.g. atlas-based image segmentation, nonlinear image registration, time series analysis and data-driven independent component analysis). We present multimodal MRI data from a longitudinal study of cognitive aging, and describe in more detail the broad range of mathematical and statistical methods that come into play for quantitative analysis. These kind of multidisciplinary tools have emerged into the recent field of computational neuroimaging, providing new biological and neurocognitive information about brain structure and function and brain-behavior relationships.

**Brief Biography of the Speaker:**
Arvid Lundervold (b. February 13th 1952) has a BSc in mathematics and philosophy from the University of Oslo (1975) and got his medical degree (MD) from the same university (1982). While in Oslo he also worked with experimental epilepsy (the hippocampal slice preparation) at the Institute of Neurophysiology and at the National Hospital. He obtained his PhD ("Multispectral Analysis, Classification and Quantification in Medical Magnetic Resonance Imaging") at the University of Bergen in 1995. He has professional experience in medical informatics from the National Hospital in Oslo (1984-1988), and as research scientist at the Norwegian Computing Center, Image Analysis and Pattern Recognition group (1989-1994), before he came to the University of Bergen in 1994. He as been programming in C and later Matlab for more than 20 years. Arvid Lundervold is married to Prof. Astri Lundervold (neuropsychologist) and they have 6 children.
He his currently a Professor in medical information technology at the University of Bergen, Department of Biomedicine, and head of the Neuroinformatics and Image Analysis Laboratory in the Neuroscience Research group . Lundervold is also affiliated as a researcher with the Department of Radiology, Haukeland University Hospital, the Molecular Imaging Center (http://www.uib.no/med/mic), the MedViz consortium (http://medviz.uib.no), the Bergen Image Processing group (http://math.uib.no/BBG), and the Bergen fMRI group (http://fmri.uib.no) headed by Prof. Kenneth Hugdahl, University of Bergen.
Lundervold has published more than 100 papers and conference reports related to medical image analysis, pattern recognition, and neuroinformatics. He has supervised or co-supervised more than twenty Master's and PhD students with their basic training from mathematics, computer science, medicine, or physiology, and is presently board chairman of the Norwegian Research School in Medical Imaging (http://www.ntnu.no/medicalimaging).
Current research interests are in the fields of image processing and pattern recognition, functional imaging, image registration, quantification and visualization, and mathematical modeling. Together with colleagues at the Departments of Mathematics, Computer Science, and Physics and Technology he has also launched a new cross-disciplinary Master's program in Biomedical Image Sciences at the University of Bergen (http://www.uib.no/studyprogramme/MAMD-HUIMG). Lundervold has been an MC and WG member of the European COST B11 concerted action ("Quantitation of Magnetic Resonance Image Texture"), the COST B21 ( "Physiological Modelling of MR Image Formation"), and the present COST BM0601 ("NEUROMATH - Advanced Methods for the Estimation of Human Brain Activity and Connectivity" – www.neuromath.eu). He has been grant reviewer for the European Science Foundation, the Welcome Trust Joint Infrastructure Fund, and NATO Scientific and Environmental Affairs Division. He has been on the Editorial board of "Computerized Medical Imaging and Graphics" since 1997, and "Frontiers in Neuroinformatics" since 2010. Lundervold is member of the Norwegian Medical Association, the International Society for Magnetic Resonance in Medicine, the IEEE Computer Society, and the American Mathematical Society.

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