International Workshop on Geometry, PDE's and Lie Groups in Image Analysis
24-26 August 2016 – Eindhoven

Remco Duits\textsuperscript{a,b}, Andrea Fuster\textsuperscript{a}, Erik Bekkers\textsuperscript{b}, Yuri Sachkov\textsuperscript{c}

\textsuperscript{a}Centre for Analysis, Scientific computing and Applications (CASA), department of Mathematics and Computer Science, TU/e, the Netherlands.
\textsuperscript{b}Biomedical Image Analysis Group, department of Biomedical Engineering, Eindhoven University of Technology (TU/e), the Netherlands.
\textsuperscript{c}CPRC, Program Systems Institute, Russian Academy of Sciences, Pereslavl-Zalessky, Russia

Session A: Geometry and Control in Vision

Wednesday 24th August 2016
Chair: Yuri Sachkov

09:15 Opening words Remco Duits and Yuri Sachkov

09:30 \textbf{A1}: Geodesics, Laplacians and random walks in sub-Riemannian geometries \textit{Ugo Boscain} (Ecole Polytechnique CMAP, Paris)

10:10 \textbf{A2}: Spatio-temporal geometry of motion perception in primary visual cortex \textit{Davide Barbieri} (Dep. de Matematicas, Universidad Autonoma de Madrid)

10:50 Mini-Break

11:10 \textbf{A3}: Tracking of Lines in Spherical Images via Sub-Riemannian Geodesics in SO(3) \textit{Alexey Mashtakov} (Control Processes Research Center, Program Systems Institute of RAS, Moscow)

11:50 \textbf{A4}: Sub-Riemannian minimizers and cut locus on the Engel group \textit{Yuri Sachkov} (CPRC, Program Systems Institute of RAS, Moscow)

12:30 Lunch

14:00 \textbf{A5}: Barycentric Subspace Analysis: an extension of PCA to Manifolds \textit{Xavier Pennec} (INRIA Sophia-Antipolis, France)

14:40 \textbf{A6}: The problem of stability in early vision, conformal geometry and spherical model of hypercolumns by Bressloff-Cowan \textit{Dmitri Alexeevsky} (Institute for Information Transmission Problems RAS, Moscow)

15:20 \textbf{A7}: Exact Solutions and Analysis of the 3D direction Process & (Hypo-)elliptic Diffusion on SE(3) \textit{Jorg Portegies} (CASA, TU/e Eindhoven)

16:00 Coffee and informal discussions

Session B: Lie Group Analysis and PDEs in Image Analysis

Thursday 25th August 2016
Chairs: Remco Duits & Erik Bekkers

09:30 \textbf{B1}: Connecting Linear Systems and Morphology \textit{Joachim Weickert} (Mathematical Image Analysis Group, Saarland University)

10:10 \textbf{B2}: Seeking invariants in the image to surface (inverse) map \textit{Steven Zucker} (Computer Science and Biomedical Engineering, Yale University) and \textit{Ben Kunsberg} (Brown University)

10:50 Mini-Break

11:10 \textbf{B3}: A cortically based system of PDEs in Lie groups for modal completion \textit{Giovanna Citti} (Dep. of Mathematics, University of Bologna)

11:50 \textbf{B4}: Time-causal and time-recursive spatio-temporal receptive fields for computer vision and computational modelling of biological vision \textit{Tony Lindeberg} (Computational Brain Science Lab, KTH Stockholm)

12:30 Lunch

14:00 \textbf{B5}: Computation of Curvature Penalized Shortest Paths via the Fast Marching Algorithm \textit{Jean-Marie Mirebeau} (Lab. de mathematiques d’Orsay, University Paris-Sud CNRS)

14:40 \textbf{B6}: Lie-groups and diffusion equations on image feature representations motivated by computational neuroscience \textit{Michael Felsberg} (Institutionen for systemteknik, Linkoping University)

15:20 \textbf{B7}: A variational formulation of the sub-Riemannian model of the primary visual cortex \textit{Dario Prandi} (CEREMADE, University Paris-Dauphine)

16:00 Mini-Break
16:20 **B8:** Image processing via invertible orientation scores of 3D images  
*Michiel Janssen* (CASA, TU/e Eindhoven)

17:00 **B9:** Multiscale Segmentation via Bregman Distances and Nonlinear Spectral Analysis  
*Christophe Brune* (Dep. of Applied Mathematics, University of Twente)

17:40 Informal discussions and walk towards workshop diner location (Natlab)

18:30 Workshop diner

**, Session C: Differential Geometry in Neuro-imaging**

_Friday 26th August 2016_

**Chair:** _Andrea Fuster_

09:30 **C1:** Non-holonomicity and Parallel Transport in Biological Fibrous Composites  
*Kaleem Siddiqi* (School of computer science, McGill University)

10:10 **C2:** Bundle Analytics: Computation in the Space of Streamlines  
*Maxime Descoteaux* (Sherbrooke Connectivity Imaging Lab, University of Sherbrooke)

10:50 Mini-Break

11:10 **C3:** Whole-brain cortical parcellation: A hierarchical method based on dMRI tractography  
*David Moreno* (Mint Labs, Barcelona)

11:50 **C4:** PDEs for Quantitative Biomedical Image Analysis  
*Thomas Schultz* (Visualization and Medical Image Analysis Group, University of Bonn)

12:30 **C5:** Implementation of Diffusions on SE(3) in DIPY and Applications in DW-MRI: Localization of the Optic Radiation for Epilepsy Surgery  
*Stephan Meesters* (CASA TU/e & Epilepsy Institute Kempenhaeghe Heeze)

13:10 Lunch

14:00 **C6:** Cartan connections on Lie groups with applications to neuroimaging (Alzheimer’s Disease modeling)  
*Marco Lorenzi* (Translational Imaging Group, University College London)

14:40 **C7:** Tracts as distributions over trajectories: Tractography and Analysis  
*Aasa Feragen* (DIKU, Dep. of Computer Science, University of Copenhagen)

15:20 Mini-Break

15:40 **C8:** Practicalities and Challenges in diffusion MRI  
*Alexander Leemans* (ISI, University Medical Center Utrecht)

16:20 **C9:** Geometry in diffusion MRI - modeling and analysis  
*Tom Dela Haije* (CASA Eindhoven University of technology)

17:00 Closing words Andrea Fuster and drinks