

Symmetry & Computation

April 2-7th, 2018

CIRM, France

Symmetry appears as a desirable feature to preserve through numerical computations, as a property to take advantage of in efficiency consideration, or as an organizing principle for computations. In either cases, sophisticated schemes that require group-theoretic foundations have been developed, as the results of research at the frontier of pure mathematics, computer science and applied mathematics. This meeting aims at creating new interactions between several different trends of group theoretic approaches in computation. The goal is to bring out the fundamental issues and uncover foundational concepts and results underlying the different methods that shall provide the guiding principles in further developments. The topics range across Geometric Integration, Symbolic Analysis, Computational Algebraic Geometry, Orthogonal Polynomials and Special Functions but with a focus on the exploitation of symmetry and group theoretic methods.

Evelyne Hubert

Elizabeth Mansfield

Hans Munthe-Kaas

Agnes Szanto

Tuesday		
		Integrators chaired by E. Mansfield
09:00-09:45	H. Munthe Kaas	Symmetry & computation : a few of my favorite things
09:45-10:15	D. Manchon	The Hopf algebra of Lie group integrators and planarly branched rough paths
Coffee		
10:45-11:30	K. Ebrahimi-Fard	Magnus expansion and Lie group integrators
11:30-12:15	Y. Xu	Symmetry and cubature rules
Lunch 12:30		
Posters	N. Benhamidouche	General self similar solutions and contour enhancement via nonlinear degenerate parabolic equations
	F. Bréhard	A Newton-like Validation Method for Chebyshev Approximate Solutions of Linear Ordinary Differential Equations
	M. Ceria	Combinatorics of involutive divisions
	M. de la Puente	Volume of alcoved polyhedra and Mahler conjecture
Posters	E. Hubert	Computing Symmetric cubatures
	N. Martins Ferreira	On the structure of a triangulation
	M. Silvis	Symmetries and conservation laws as constraints for the modeling and numerical simulation of turbulent flows
		Conservations laws chaired by H. Munthe Kaas
16:00-16:45	E. Mansfield	Noether's Theorem, then and now
16:45-17:15	G. Frasca Caccia	Simple bespoke finite difference methods that preserve conservation laws
Break		
17:45-18:30	L. Peng	Symmetries of Differential-Difference Equations and Noether's Conservation Laws
18:30-19:15	W. Hereman	Continuous and Discrete Homotopy Operators with Applications

Wednesday		
		Dynamical Systems chaired by E. Hubert
09:00-09:45	P. Chossat	Computational aspects of equivariant bifurcation theory
09:45-10:15	N. Kruff	Coordinate-independent criteria for Hopf bifurcations
Coffee		
10:45-11:30	E. Dufresne	Toric reparametrization of linear compartment models
11:30-12:15	S. Walcher	Dimension reduction for chemical reaction equations
Lunch (12:30) & discussions		
		Lie and Galois groups chaired by A. Szanto
16:00-16:45	P. Olver	Computation with moving frame
16:45-17:15	C. Shakiban	Applications of cumulative distance histograms in diagnosing breast cancer
17:45-18:30	M. Singer	Walks, Groups, and difference equations
18:30-19:15	J.-A. Weil	Symmetries of linear differential systems and their relation to Galois groups
Dinner		
21:00	<i>J. Bensoam</i>	<i>Discussion around the project Geometry for Exascale Computing</i>

Thursday		
A day in celebration of E. Mansfield's prime birthday		
		Morning chaired by M. Singer
09:00-09:45	A. Stern	Hybrid finite element methods preserving symmetries and conservation laws
09:45-10:15	A. Rojo-Echeburua	Discrete moving frames, evolution of curvature invariants and discrete integrability
Coffee		
10:45-11:30	A. Szanto	Multivariate symmetric interpolation, subresultants and Jacobi polynomials
11:30-12:15	E. Hubert	Invariants of ternary forms under the orthogonal group
Lunch (12:30) & discussions		
		Afternoon chaired by W. Hereman
16:00-16:45	P. Hydon	Geometric structures for difference equations
16:45-17:15	M. Zadra	Moving frames and conservation laws: a linear action of $SU(2)$
Break		
17:45-18:30	A. Iserles	Skew-symmetry and computation
18:30-19:15	P. Clarkson	Orthogonal Polynomials and Integrable Systems
19:30 Banquet		

Friday		
		Finite Groups chaired by E. Hubert
09:00-09:45	A. Hulpke	A survey of group theoretic algorithms
09:45-10:15	G.Dhont	Symbolic interpretation of the generating function in invariant theory
Break		
10:45-11:30	C. Riener	Computing the homology of symmetric semi-algebraic sets
11:30-12:15	S. Olver	Representation theory of the symmetric group, numerically
Lunch (12:30) & discussions		
		Numerics chaired by H. Munthe Kaas
16:00-16:45	O. Verdier	Symmetries in Numerical Analysis
16:45-17:15	M. Silvis	Symmetry constraints for the modeling and numerical simulation of turbulent flows
Break		
17:45-18:30	A. Schmeding	Shape analysis on homogeneous spaces
18:30-19:15	J. Bensoam	Multisymplectic geometry and covariant formalism for mechanical systems with a Lie group as configuration space: application to the Reissner beam

Saturday

		Invariants & applications chaired by A. Szanto
09:00-09:45	B. Kolev	Invariants and covariants in Solid Mechanics
09:45-10:15	F. Reimers	Separating invariants of finite groups
Coffee		
10:45-11:30	M. Olive	About Gordan's algorithm for binary forms