IV INTERNATIONAL SUMMER SCHOOL ON GEOMETRY, MECHANICS AND CONTROL

Santiago de Compostela, Spain
July 5-9, 2010

http://www.gmcnetwork.org/ssgmc10

INVITED SHORT TALKS

TUESDAY JULY 6, 2010

17:00- 17:15 Paula Balseiro (IMPA, Brazil)
Title: Applications of the Hamilton-Jacobi equation.

Abstract: We will see how the Hamilton Jacobi equation can be applied to solve different kinds of mechanical systems such us nonholonomic systems with affine constraints, systems subjected to external forces and time dependent systems. The theory will be presented though an example.

J17:15-17:30 Javier de Lucas (Institute of Mathematics of the Polish Academy of Science, Poland)
Title: *Lie Families: theory and applications*

Abstract: We analyse families of non-autonomous systems of first-order ordinary differential equations admitting a common time-dependent superposition rule, i.e. a time-dependent function expressing the general solution of each system of the family in terms of any generic set of particular solutions of the system and some constants. We next study relations of these families, called Lie families, with the theory of Lie and quasi-Lie systems and apply our theory to provide common time-dependent superposition rules for certain Lie families.

17:30-17:45 David Martínez (Instituto Superior Técnico de Lisboa, Portugal)
Title: *Universal models for locally conformally symplectic manifolds*

Abstract: Any integral symplectic structure on a compact manifold can be induced via an embedding in some projective space. We prove an extension of this theorem to locally conformally symplectic (l.c.s.) structures, and relate it to recent results in locally conformally Kahler geometry. Likewise, we also produce universal models for l.c.s. structures via reduction. This is joint work with J. C. Marrero and E. Padrón.

17:45-18:00 Viviana Díaz (University of Nacional del Sur, Argentina)
Title: *Euler-Poincaré equations by several stages*

Abstract: The reduction of the Euler-Lagrange equations by means of reduction of Hamilton's principle using a geometric point of view gives rise to the Euler-Poincar_e equations. In the case in which the group has a chain of normal subgroups, the decomposition of the Lie algebra and the resulting expression for the Lie bracket lead to a decomposition by stages of the Euler-Poincar_e equations. Our aim is to show explicit expression of the Euler-Poincar_e equations by several stages in terms of a given principal connection.

THURSDAY JULY 8, 2010

17:00-17:15 Silvia Vilariño (University of Santiago de Compostela, Spain)
Title: *Polysymplectic manifolds and Marsden-Weinstein reduction*

Abstract: Gunther's paper [J. Differential Geom. 25 (1987) 2353] gives a geometric Hamiltonian formalism for field theories. The crucial device is the introduction of a vector-valued generalization of a symplectic form, called a polysymplectic form. One of the advantages of this formalism is that one only needs the tangent and cotangent bundle of a manifold to develop it. The canonical model of polysymplectic manifolds is the Whitney sum of k copies of the cotangent bundle of a manifold.
The aim of this talk is to de_ne quotients of polysymplectic manifolds which inherit the respective structure in an analogous way that in the Marsden-Weintein reduction for a symplectic manifold. As a consequence a Kirillov-Kostant-Souriau theorem for polysymplectic manifolds will be proved.

17:15-17:30 Marco Caponigro (Institut Elie Cartan, France)
Title: *Controllability on the group of diffeomorphisms*

Abstract: Given a compact manifold M, we prove that any bracket generating family of vector fields on M, which is invariant under multiplication by smooth functions, generates the connected component of the identity of the group of diffeomorphisms of M. Joint work with Andrei A. Agrachev.

17:30-17:45 Anna Korolko (University of Bergen, Norway)
Title: *Sub-semi-Riemannian geometry on Heisenberg-type groups*

Abstract: We consider Heisenberg-type groups whose law of left translation gives rise to a bracket generating distribution of step 2. In the contrast with sub-Riemannian studies we furnish the horizontal distribution with a nondegenerate indefinite metric of arbitrary index and investigate the problem concerning causal geodesics on associated manifolds.

17:45-18:00 David Ellis (Imperial College London, UK)
Title: *Unreduction*

Abstract: Reduction by symmetry is a powerful technique for lowering the order of problems in geometric dynamics. But recent advances in image dynamics indicate that the reverse procedure, called `unreduction', is also useful. We shall look at the geometry of unreduction, and the benefits it bestows upon image dynamics.