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Rigid Body Dynamics on Real Forms of Semisimple Complex Lie Algebras

Mishchenko and Fomenko have introduced free rigid body systems on complex semisimple Lie algebras, their compact and split-compact forms. These are geodesic systems of left-invariant Riemannian metrics on the underlying Lie groups, expressed in body coordinates. The Riemannian metric is given by an inner product, determined by a so-called sectional operator, on the Lie algebra. They have shown in the late 70s that these systems are completely integrable. However, since their introduction, nothing has been done about the systems induced on other real forms, nor has the stability of the relative equilibria of these systems been investigated (the analogue of the long and short axis stability theorem for the classical free rigid body). In this talk, I will report on progress on these problems achieved with D. Tarama. The integrability of these systems will be shown as well as the Lyapunov stability/instability of generic relative equilibria will be presented. Progress on these fronts so long after the introduction of these systems is due to results of Bolsinov, Izosimov, and Oshemkov, which will be briefly presented.

Tudor Ratiu got both his BA and MA in pure, respectively, applied mathematics from the West University of Timisoara, Romania, and his Ph.D. from the University of California at Berkeley. He was a T.H. Hildebrand Research Professor at the University of Michigan, Ann Arbor, Associate Professor at the University of Arizona, Tucson, Professor at the University of California, Santa Cruz, Chaired Professor at the Swiss Institute of Technology, Lausanne, and is currently Chaired Professor at Shanghai Jiao Tong University. He has held visiting positions at over 45 universities and mathematics institutes worldwide. He was an NSF Postdoctoral Fellow, a Sloan and Fulbright Fellow, and a Miller Research Professor at Berkeley. He is the winner of the Humboldt Senior Professorship and of the Ferran Sunyer i Balaguer Prize of the Institut d'Estudis Catalans in Barcelona, jointly with Juan-Pablo Ortega. He was awarded the 'Star of Romania' medal for his scientific achievements and became AMS Fellow in the inaugural year of the program. He is the winner of the Russian Megagrant, of the Tullio Levi Civita Prize for the Mathematical and Mechanical Sciences in Italy, and most recently of the 1000 Talent Prize of the Shanghai City Government. He was and is on the editorial board of several journals and book series. He has published over 230 papers and seven books, one translated into German and Chinese. He was a founder and the founding director of the Bernoulli Center at the Swiss Federal Institute of Technology, Lausanne, a program oriented mathematics research institute, which he led for 12 years.