



Laboratory of Nonlinear Analysis and the Design of New Types of Vehicles

Year of establishment: 2010

Head of the laboratory: Dmitry V. Treschev

About the head of the laboratory: Corresponding Members of the Russian Academy of Sciences, professor. Deputy director of Research at the Institute of Mathematics named after V. A. Steklov of the Russian Academy of Sciences, professor of the department of theoretical mechanics of the Faculty of Mechanics and Mathematics of the Lomonosov Moscow State University. Member of editorial staff of Nonlinearity, Chaos, Mathematical Notes, Regular and Chaotic Dynamics, and Discrete and Continuous Dynamical Systems journals. His main research focus is dynamical systems of classical mechanics.

Organization hosting the laboratory: Udmurt State University

Location: Izhevsk

Areas of research: Modern robotics, mechanics, control theory.
Development and implementation of new methods of terrestrial and aquatic locomotion.
Improvement of maneuverability of existing vehicles (new types of wheels), design of new types of vehicles to be used, for example, in space and on other planets.

Laboratory's website: lab.ics.org.ru



Research goal

Search and development of new methods of terrestrial and aquatic locomotion. Design of mechanisms implementing these methods.



The most significant scientific results achieved by the laboratory since its establishment

Samples of mobile systems have been created: four modifications of spherical robot, wheeled vehicle based on mecanum wheels, screw-free marine mobile system. New analysis methods have been developed for dynamics of robotic systems, including nonholonomic systems and systems with friction.



Practical significance of the scientific results for science, technology, economics etc.

The conducted research allows to develop dynamical control algorithms for robots and to analyze areas of stable movement of mobile vehicles. The designed vehicles with solid outer shell without an external propulsor can become the basis of robots functioning in extreme environment.



Dmitry V. Treschev

“ We have managed to achieve a unique union of theoretical research with experimental developments in mechanics and robotics



One of the modifications of spherical robots developed by the laboratory



How will the research conducted by the laboratory improve quality of life and enhance understanding of the world?

Development of robots adapted for extreme environment (chemical pollution, radiation etc.), in particular, spherical robots, will allow to relieve humans from the necessity to perform high risk activities.



How has the laboratory influenced the development of the host organisation?

The results of work on the project are being actively implemented in the teaching and learning process of the Faculty of physics and energy of the Udmurt State University. Employees of the laboratory continuously deliver lectures and conduct practical training.



What organisations does the laboratory cooperate with?

Institute of Celestial Mechanics and Computation of Ephemerides (IMCCE), France
National Autonomous University of Mexico, Mexico
Loughborough University, UK
University of Zielona Góra, Poland
Polytechnic University of Catalonia, Spain

INFORMATION ABOUT THE LABORATORY

