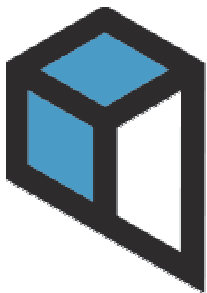


13th International Conference on
Electromechanics and Robotics
"Zavalishin's Readings"

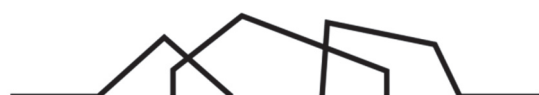
ER(ZR)-2018

Conference Programme

**St. Petersburg, Russia,
April 18-21, 2018**



**Zavalishin's
Readings | 2018**



DWIH Moskau



Land der Ideen



Organizers

The conference is organized by

- St. Petersburg State University of Aerospace Instrumentation (SUAI, St. Petersburg, Russia)
- St. Petersburg Institute for Informatics and Automation of the Russian Academy of Sciences (SPIIRAS, St. Petersburg, Russia)

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Co-Chairs

Prof. Anatoliy Ovodenko

Prof. Vladislav Shishlakov

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Keynote Lectures



Michael Beetz, Professor for Computer Science at the Faculty for Mathematics and Informatics of the University of Bremen and head of the Institute for Artificial Intelligence (IAI), University of Bremen, Germany

Lecture Title: Robotics Challenges for Everyday Activity Science and Engineering (EASE)

Abstract: Mastering everyday activities is an important step for robots to become the competent (co-)workers, assistants, and companions who are widely considered a necessity for dealing with the enormous challenges our aging society is facing. In the talk the achievements of Collaborative Research Centre “Everyday Activity Science and Engineering” (EASE) focused on a fundamental research endeavour to investigate the cognitive information processing principles employed by humans to master everyday activities and to transfer the obtained insights to models for autonomous control of robotic agents is discussed. The aim of EASE is to boost the robustness, efficiency, and flexibility of various information processing subtasks necessary to master everyday activities by uncovering and exploiting the structures within these tasks.



Karsten Berns, Head of Robotics Research Lab, TU Kaiserslautern, Kaiserslautern, Germany

Lecture Title: Emotion-based Human-Robot Interaction

Abstract: Human-machine interaction is a major challenge in the development of complex humanoid robots. In addition to verbal communication the use of non-verbal cues such as hand, arm and body gestures or mimics can improve the understanding of the intention of the robot. On the other hand, by perceiving such mechanisms of a human in a typical interaction scenario the humanoid robot can adapt its interaction skills in a better way. Based on the two humanoid robots ROMAN and ROBIN of the Robotics Research Lab of the University of Kaiserslautern typical interaction scenarios will be presented.



Christian Ott, Head of Department "Analysis and Control of Advanced Robotic Systems", Institute of Robotics and Mechatronics, DLR, Wessling, Germany

Lecture Title: Physical Interaction with Elastic Robots: From Torque Control to Utilization of Intrinsic Compliance

Abstract: Many robotic systems, like industrial manipulators and complex humanoid robots, are designed not only for pure motion generation but also for tasks that involve physical interaction with the environment. It requires an exchange of physical power between the robot and the environment, which lead to the concepts of impedance control and passivity. In case of human-robot interaction additionally safety aspects play an important role in the controller design. Early approaches for interaction control focused on measuring the interaction force either with a force/torque sensor in the wrist, or with joint torque sensors in order to implement a sensitive compliant behavior. More recently, actuators with intrinsic compliance have been proposed in order to increase performance as well as energy efficiency, especially in periodic tasks. Our framework for interaction control with such elastic robots has originated from our earlier works on impedance control for robots with joint torque sensors and has experimentally verified with various robotic systems, ranging from stationary and mobile manipulators to complete legged humanoids.







Sebastian Stueker, Leader of Group: RG 3-01 'Multilingual Speech Recognition' and KIT associate fellow, KIT, Karlsruhe, Germany

Lecture Title: Speech Interaction Strategies for a Humanoid Assistant

Abstract: The goal of SecondHands, a H2020 project, is to design a robot that can offer help to a maintenance technician in a proactive manner. The robot is to act as a second pair of hands that can assist the technician when he is in need of help. In order for the robot to be of real help to the technician, it needs to understand his needs and follow his commands. Interaction via speech is a crucial part of this. Due to the nature of the situation in which the interactions take place, often the technician needs to speak to the robot when under stress performing strenuous physical labor, the classical turn based interaction schemes need to be transformed into dialogue systems that perform stream processing, anticipating user intentions, correcting itself as more information become available, in order to be able to respond in a rapid manner.

**Invited Speakers for the Conference and Russian – German Round Table
“The impact of robotics on the profession of the future”**

	<p>Ella Detkova, CLAAS, Germany Lecture Title: Automation of work processes on CLAAS example as a factor for the transformation of requirements to the profession</p>
	<p>Viktor Naumov, The Institute of State and Law of the Russian Academy of Sciences, Dentons, Moscow, Russia Lecture Title: Socio-ethical and legal problems of the introduction of robots and AI</p>
	<p>Oliver Jokisch, Professor, Institute of Communications Engineering, Leipzig University of Telecommunications, Leipzig, Germany Lecture Title: Advances in the development of a cognitive user interface</p>
	<p>Ilshat Mamaev, Member of Intelligent Process Automation and Robotics Lab KIT, Karlsruhe, Germany Lecture Title: Intelligent control in service and industrial robotics</p>

Conference at a glance

Wednesday, April 18, 2018			
16:00-18:00	Registration		
Thursday, April 19, 2018			
09:00-09:30	Registration		
09:30-10:00	Opening Ceremony (Davinchi Hall)		
10:00-11:00	Keynote Lecture 1: <i>Karsten Berns.</i> Emotion-based human-robot interaction (Davinchi Hall)		
11:00-11:10	Joint Photography of Conference Participants (Davinchi Hall)		
11:10-11:30	Coffee break		
11:30-13:30	Oral Session 1: Robotics and Automation (Davinchi Hall)	Oral Session 2: Electromechanics and Electric Power Engineering (Room: 51-06-01)	Poster Session I (Room: 51-06-02)
13:30-14:30	Lunch break (Room 5109, café "Polet")		
14:30-15:30	Keynote Lecture 2: <i>Sebastian Stüker.</i> Speech interaction strategies for a humanoid assistant		
15:30-16:00	Coffee break		
16:00-18:00	Russian – German Round Table “The impact of robotics on the profession of the future” (Davinchi Hall)	Oral Session 3: Robotics and Automation (Room: 51-06-01)	Poster Session II (Room: 51-06-02)
18:30-20:00	Welcome reception of German Centre for Research and Innovation Moscow (DWIH) (Hotel "Domina Prestige", Moika Embankment, 99, restaurant "Arkobaleno")		
Friday, April 20, 2018			
09:00-10:00	Registration		
10:00-11:00	Keynote Lecture 3: <i>Michael Beetz.</i> Robotics challenges for everyday activity science and engineering (EASE) (Davinchi Hall)		
11:00-11:30	Coffee break		
11:30-13:30	Oral Session 4: Robotics and Automation (Davinchi Hall)	Oral Session 5: Electromechanics and Electric Power Engineering (Room: 51-06-01)	Demo Session II (Room: 51-06-02)
13:30-14:30	Lunch break (Room 5109, café "Polet")		
14:30-15:30	Keynote Lecture 4: <i>Christian Ott.</i> Physical interaction with elastic robots: from torque control to utilization of intrinsic compliance (Davinchi Hall)		
15:30-16:00	Coffee break		
16:00-18:00	Oral Session 6: Robotics and Automation (Davinchi Hall)	Oral Session 7: Electromechanics and Electric Power Engineering (Room: 51-06-01)	Poster Session III (Room: 51-06-02)
18:00-18:30	Closing Ceremony (Davinchi Hall)		
Saturday, April 21, 2018			
11:00-12:00	St. Petersburg museum tour (The Yusupov Palace on the Moika River, Moika Embankment, 94)		

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11:10-11:30	Coffee break
	Oral Session 1: Robotics and Automation (Davinci Hall)
11:30-13:30	Highly passable propulsive device for UGVs on rugged terrain <i>V. Gradetsky, I. Ermolov, M. Knyazkov, B. Lapin, Eu. Semenov, S. Sobolnikov and A. Sukhanov</i> Approaches to the robotization of agricultural mobile machines <i>V. Serebrenny, M. Shereuzhev and I. Metasov</i> Hierarchical classification of robotic grippers applied for agricultural object manipulations <i>Q. Vu, M. Kuzov and A. Ronzhin</i> Remote control library and GUI development for Russian crawler robot Servosila Engineer <i>I. Mavrin, R. Lavrenov, M. Svinin, S. Sorokin and E. Magid</i> Automated system of monitoring and positioning of functional units of mining technological machines for coal-mining enterprises <i>Ya. Meshcheryakov and R. Meshcheryakov</i>
	Oral Session 2: Electromechanics and Electric Power Engineering (Room: 51-06-01)
11:30-13:30	Control of shimmy vibration in aircraft landing gears based on tensor product model transformation and twisting sliding mode algorithm <i>S. Kuntanapreeda</i> Energy-efficient control of a multi-section supercapacitor power supply of an electric drive <i>V. Mozzhechkov</i> Multi-alternative control of large systems <i>S. Podvalny and E. Vasiljev</i> Stability of digital feedback control systems <i>E. Larkin, A. Bogomolov and S. Feofilov</i> Development trends of combined inductance-capacitance electromechanical energy converters <i>H. Karayan and S. Gandilyan</i> Synthesis of control laws of electromechanical systems under polynomial approximation of characteristics of nonlinear elements <i>V. Shishlakov, E. Vataeva, N. Reshetnikova and D. Shishlakov</i>

	<p>Poster Session I (Room: 51-06-02)</p>
<p>11:30-13:30</p>	<p>A decentralised solution for coordinating decisions in large-scale autonomic systems <i>O. Melekhova, J. Malenfant, R. Mescheriakov and A. Chueshev</i></p> <p>A fuzzy adaptive sliding mode controller for uncertain nonlinear multi motor systems <i>T. Tinh, T. Pham, T. Tran, T. Nguyen and N. Dao</i></p> <p>Blockchain-based framework for ontology-oriented robots' coalition formation in cyberphysical systems <i>N. Teslya and A. Smirnov</i></p> <p>Complex modeling and combined methods of planning the functioning of railway trains entering the transport and logistics network <i>B. Sokolov, S. Potryasayev and A. Gnidenko</i></p> <p>Issues of physical interaction of unmanned aircraft manipulators with ground objects <i>V. Nguyen, O. Solenaya and P. Smirnov</i></p> <p>Classification of robotic battery service systems for unmanned aerial vehicles <i>T. Ngo, O. Solenaya and V. Dashevsky</i></p> <p>Ontology-driven approach for describing industrial socio-cyberphysical systems' components <i>N. Teslya and I. Ryabchikov</i></p> <p>Organization of information exchange in the underwater space in a single local information and control system of the Navy <i>I. Galkin, R. Chochoev and P. Andrianov</i></p> <p>Processing models for conflicting user requests in ubiquitous corporate smart spaces <i>D. Levonevskiy, I. Vatamaniuk and A. Saveliev</i></p> <p>Psychophysiological aspects of interactive speech interaction with robotic and cyberphysical systems in aviation <i>V. Kharitonov, A. Dolgov and A. Esev</i></p> <p>Review of methods and approaches to the localization of unmanned aerial vehicles <i>I. Vorobyov and I. Durmashev</i></p> <p>Smartphone-based tourist trip planning system: an context-based approach to offline attraction recommendation <i>S. Mikhailov and A. Kashevnik</i></p> <p>Software for real-time vision systems for robotics control systems <i>S. Sokolov and A. Boguslavsky</i></p> <p>The control system of the anthropomorphic robot module <i>N. Grechkin</i></p> <p>The method of structural mutations in models of robotic manipulation systems <i>O. Krakhmalev</i></p> <p>Trajectory control of wave gliders in the formation of a control system for underwater objects in an unknown environment <i>O. Borisov and D. Galkina</i></p> <p>Transfer of service and multimedia data in IoT-networks using hybrid communication devices for proactive localization and navigation of users in cyberspace <i>A. Saveliev, A. Edemsky, D. Malov, D. Chukhno and V. Kudrin</i></p>
<p>13:30-14:30</p>	<p>Lunch break (Room 5109, café "Polet")</p>

14:30-15:30	<p>Keynote Lecture 2: <i>Sebastian Stueker</i>. Speech Interaction Strategies for a Humanoid Assistant (Davinchi Hall)</p>
15:30-16:00	Coffee break
16:00-18:00	<p>Russian – German Round Table “The impact of robotics on the profession of the future” (Davinchi Hall)</p> <p>Automation of work processes on CLAAS example as a factor for the transformation of requirements to the profession <i>Ella Detkova</i> Socio-ethical and legal problems of the introduction of robots and AI <i>Viktor Naumov</i> Evolution of the movement "Young Professionals" WorldSkills Russia in the concept of FutureSkills <i>Sergey Solyonyj</i> Recent trends in industrial robotics <i>D. Nguyen and R. Timofeyev</i> History and new perspectives of SPIIRAS collaboration with German partners <i>A. Ronzhin and A. Smirnov</i></p>
	<p>Oral Session 3: Robotics and Automation (Room: 51-06-01)</p> <p>Advances in the development of a cognitive user interface <i>O. Jokisch and M. Huber</i> Impact of the face angle to traveling trajectory during the riding standing-type personal mobility device <i>J. Kim, K. Sato, N. Hashimoto, A. Kashevnik, K. Tomita, S. Miyakoshi, Y. Takinami, O. Matsumoto and A. Boyali</i> A dataset of head and eye gaze during dyadic interaction task for modeling robot gaze behavior <i>M. Rakovic, N. Duarte, J. Tasevski, J. Santos-Victor and B. Borovac</i> Mobile robot control based on noninvasive brain-computer interface using hierarchical classifier of imagined motor commands <i>F. Gundelakh, L. Stankevich and K. Sonkin</i> Mathematical support and software for data processing in robotic neurocomputer systems <i>V. Romanchuk</i> A comparison of multi-style DNN-based TTS approaches using small datasets <i>S. Suzic, T. Delic, V. Jovanovic, M. Secujski, D. Pekar and V. Delic</i></p>
16:00-18:00	<p>Poster Session II (Room: 51-06-02)</p> <p>Analysis of the reasons of the violation of the stability of cloud systems with the assumption of reliability and operative requirements <i>V. Mylnikov and T. Yelina</i> Analysis of Russian Federation legislation and proposals to change the procedure for technological connection to electricity mains <i>K. Kireev</i></p>

	<p>Assessment of initial technical states of electromechanical devices <i>V. Golubkov, I. Eltyшева and A. Fedorenko</i></p> <p>Chemistry of artificial muscles: new perspectives based on the use of carbon nanostructured materials <i>Yu. Nikolaev and P. Trump</i></p> <p>Determination of vibrational energy flows from electrodynamic interactions in systems with conductive elements <i>Ju. Sepp and N. Fedorov</i></p> <p>Development of a diagnostic node for automatic analysis of the state of overhead power lines <i>S. Solyonyj, O. Solenaya and A. Shabanova</i></p> <p>Development of an adaptive control system for the thermal fields of the coolant in the core of the nuclear reactor <i>A. Ljashenko</i></p> <p>Development of CAD for the electrical part of stations and substations for the educational process <i>V. Pavlyukov, S. Tkachenko and A. Kovalenko</i></p> <p>Engineering practice for calculating magnetic fields in the devices design of power electronics <i>S. Bardinskij, A. Efimov and S. Mel'nikov</i></p> <p>Estimation of thermomechanical stability of high-precision electromechanical angle sensors <i>I. Salova</i></p> <p>Field suppression method of the rotating exciter field winding <i>D. Kukushkin</i></p> <p>Increase of sensitivity of the actuating electric drive of a power gyroscopic complex with low rotation velocity <i>D. Jakimovskij and D. Polozhencev</i></p> <p>Modeling of emergency modes of electric power systems <i>S. Lach and O. Solenaya</i></p> <p>Oxidation of 2-pentyl 1-nonenal in the presence of an aqueous solution of sodium hydroxide <i>T. Krylov, Yu. Vigrankenko, S. Kocheregin and A. deVecchi</i></p> <p>Problems of solar power installations using in Russia and the world <i>I. Maksimova</i></p> <p>Research on the influence of water pipes material on heat exchange processes in it <i>V. Akopov and I. Salova</i></p>
18:30-20:00	<p>Welcome reception of German Centre for Research and Innovation Moscow (DWIH) (Hotel "Domina Prestige", Moika Embankment, 99, Restaurant "Arkobaleno"</p>

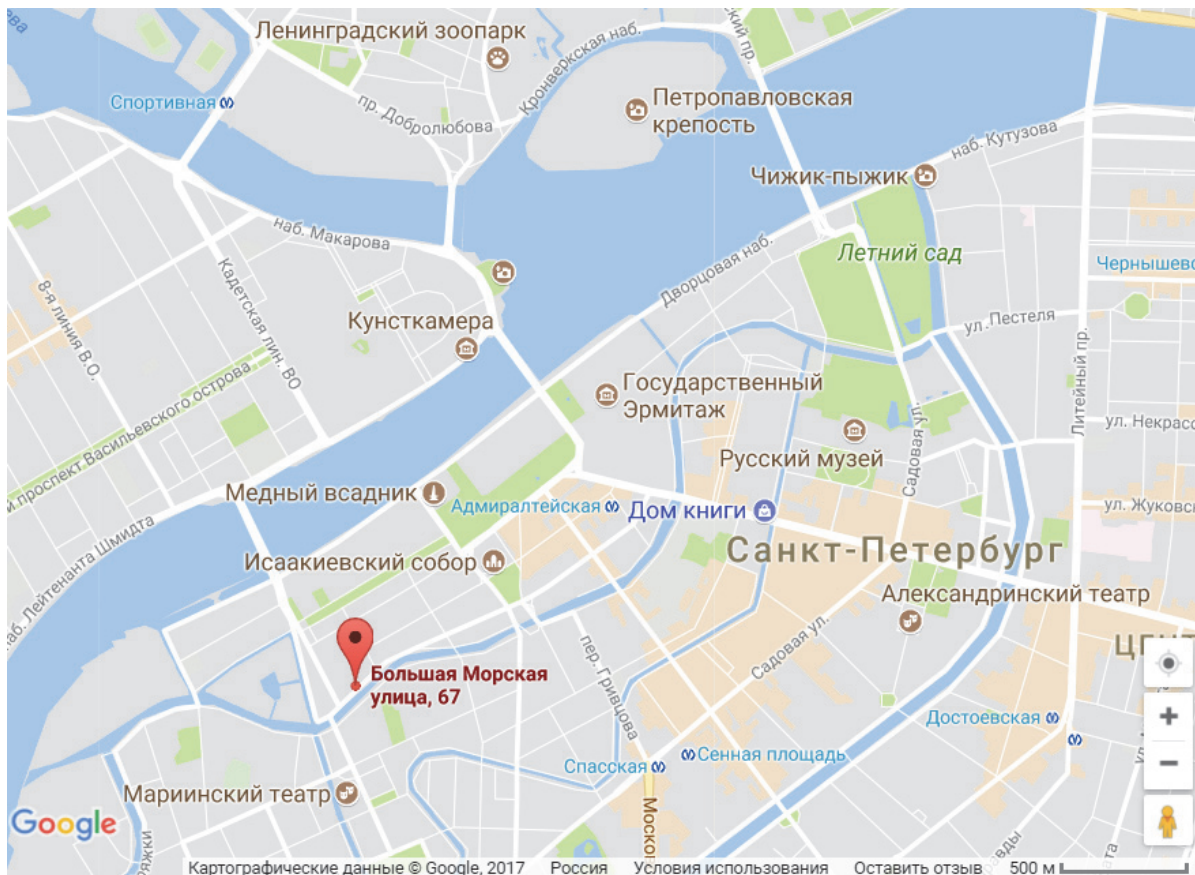
Friday, April 20, 2018	
09:00-10:00	Registration
10:00-11:00	Keynote Lecture 3: <i>Michael Beetz</i> . Robotics challenges for everyday activity science and engineering (EASE) (Davinchi Hall)
11:00-11:30	Coffee break
	Oral Session 4: Robotics and Automation (Davinchi Hall)
11:30-13:30	<p>Implementation of Impedance Trajectory Control on a 6-DoF Manipulator <i>I. Shardyko and V. Titov</i></p> <p>Investigation of the dynamical characteristics of the lower-limbs exoskeleton actuators <i>A. Yatsun, A. Karlov, A. Malchikov and S. Jatsun</i></p> <p>Synthesis of structural scheme of drive of adaptive multiple-link gripper <i>A. Bogdanov, A. Permyakov and Yu. Zhdanova</i></p> <p>The control algorithm of the lower limb exoskeleton synchronous gait <i>V. Antipov, A. Postolny, A. Yatsun and S. Jatsun</i></p> <p>Map representation using hidden Markov models for mobile robot localization <i>J. Savage, O. Fuentes, L. Contreras and M. Negrete</i></p> <p>State observer design for a walking in-pipe robot <i>S. Savin, S. Jatsun and L. Vorochaeva</i></p>
	Oral Session 5: Electromechanics and Electric Power Engineering (Room: 51-06-01)
11:30-13:30	<p>Investigation of the structural characteristics of the electrodes of energy storage devices used in power plants based on renewable energy sources <i>E. Kiseleva and F. Lelin</i></p> <p>Estimation of spark protection device's reliability influence on the fire safety of apartment's network with harmonic currents and voltage up to 1 kV <i>P. Kuznetsov, S. Solyonyj, Yu. Sychev, V. Shishlakov and O. Solenaya</i></p> <p>Intellectual decision-making system in the context of potentially dangerous nuclear power facilities <i>A. Danilov, V. Povarov, V. Burkovsky, S. Podvalny and K. Gusev</i></p> <p>Maintenance problems of PWM-inverters in power networks with distributed generation <i>P. Kuznetsov, S. Solyonyj, Yu. Sychev and B. Abramovich</i></p> <p>Gaz diffusion layers from functional carbon materials for fuel cells used in energy installations <i>E. Kiseleva and A. Vasilenko</i></p> <p>Data support system for controlling decentralised nuclear power industry facilities through uninterruptible condition monitoring <i>V. Povarov, A. Danilov, V. Burkovsky, S. Podvalny and K. Gusev</i></p>
13:30-14:30	Lunch break (Room 5109, café "Polet")

14:30-15:30	Keynote Lecture 4: <i>Christian Ott</i> . Physical interaction with elastic robots: from torque control to utilization of intrinsic compliance (Davinchi Hall)
15:30-16:00	Coffee break
16:00-18:00	Oral Session 6: Robotics and Automation (Davinchi Hall)
	<p>Intelligent control in service and industrial robotics <i>A. Heilig, I. Mamaev, B. Hein and D. Malov</i></p> <p>Active stabilization in robotic vision systems <i>V. Serebrennyi, A. Boshliakov and G. Ovsiankin</i></p> <p>Experiments on mobile robot stereo vision system calibration under hardware imperfection <i>R. Safin, R. Lavrenov, S. Saha and E. Magid</i></p> <p>The model of UAV formation based on the uniform allocation of points on the sphere <i>M. Khachumov</i></p> <p>Robust anti-windup control for marine cyber-physical systems <i>M. Kakanov, M. Kaliuzhny, O. Borisov, V. Gromov, S. Vlasov, S. Somov and A. Pyrkin</i></p> <p>Reinforcement learning and CNN system for firefighting rescue robot <i>K. Tien, Y. Chieh and H. Samani</i></p>
16:00-18:00	Oral Session 7: Electromechanics and Electric Power Engineering (Room: 51-06-01)
	<p>Solution of the inverse kinematic problem of intelligent electromechanical systems <i>V. Kurbanov</i></p> <p>Airborne data acquisition system and rocket model control system <i>A. Chernjaev and A. Kumarin</i></p> <p>Automatic detection system of potentially dangerous fast moving objects <i>S. Solyonyj and D. Shavliashvili</i></p> <p>Evolution of management decision support systems in industry <i>G. Armashova-Tel'nik, M. Kanavcev and V. Serditov</i></p> <p>Development of a synchronous HTSC wind turbine with axial magnetic flux and internal stator (AFIS) <i>A. Markelov and A. Boltneva</i></p> <p>Transfer of housekeeping and multimedia data in IOT-networks using hybrid intercoupler <i>A. Saveliev, D. Malov and M. Tamashakin</i></p>
16:00-18:00	Poster Session III (Room: 51-06-02)
	<p>Active rectifier relay control systems <i>A. Efimov</i></p> <p>Adaptive control of vehicle hybrid system <i>S. Serikov, S. Solyonyj, E. Serikova and V. Shishlakov</i></p> <p>Analysis of systems with distributed parameters using frequency quality criteria <i>I. Pershin and A. Liashenko</i></p> <p>Analysis of magnetic and thermal fields of synchronous wind generator with axial</p>

	<p>flux and permanent magnets <i>S. Trubeneva and E. Malatynskaja</i></p> <p>Fuzzy modification of the adaptive system with identifier <i>M. Burakov and M. Brunov</i></p> <p>High-sensitivity digital filter <i>V. Akopov and E. Ichetovkin</i></p> <p>Higher Education and Human Capital as the Basis of Innovation in Russia <i>I. Eltysheva</i></p> <p>Management of the production potential of energy companies <i>V. Semenova</i></p> <p>New knowledge and competencies, in demand at technological enterprises <i>G. Armashova-Telnik, M. Kanavtsev and V. Serditov</i></p> <p>New types of synchronous condensers for power systems <i>A. Boltneva and S. Timofeyev</i></p> <p>On the formulation of the problem of simulation modeling of the functioning of information security systems <i>I. Eltysheva and B. Eltyshev</i></p> <p>Overview of synchronous generators with permanent magnets and axial magnetic flux <i>S. Timofeyev</i></p> <p>Parameters optimization in rated mode of synchronous wind generator with axial flux and permanent magnets <i>S. Timofeyev and A. Markelov</i></p> <p>Peculiarity and requirements of energy audit of social organizations <i>V. Semenova and K. Sveshnikov</i></p> <p>Semi-active research complex of extreme regulation systems <i>E. Vataeva, I. Krivolapchuk and V. Shishlakov</i></p> <p>Solution of systems of logical equations using genetic algorithm <i>V. Kurbanov and M. Burakov</i></p> <p>Synthesis of the parameters of control laws of nonlinear automatic control systems for polynomial approximation <i>V. Shishlakov, E. Vataeva, N. Reshetnikova and D. Shishlakov</i></p>
18:00-18:30	Closing Ceremony (Davinci Hall)
Saturday, April 21, 2018	
11:00-12:00	St. Petersburg museum tour (The Yusupov Palace on the Moika River, Moika Embankment, 94, http://www.saint-petersburg.com/palaces/yusupov-palace)

Venue

The conference will be organized at the campus of the St. Petersburg State University of Aerospace Instrumentation (67, Bolshaya Morskaya Str) in Davinchi Hall.



St. Petersburg museum for tour

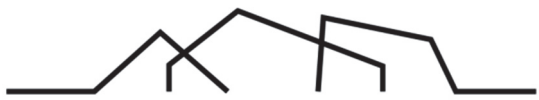
Foreign participants are invited to the sightseeing tour in the Yusupov Palace on the Moika River. This Palace Ensemble, widely known in Europe and bearing the status of "the building of Federal significance" in Russia, once belonged to a princely family. Later, it housed a Museum of the Nobility Lifestyle, Regional Teacher's House and St. Petersburg Palace of Culture for Educators. During the two and a half centuries the purpose and status of this classic mansion and urban estate have been repeatedly changed.



Contacts

E-mail: zav-read@guap.ru

Web site: <http://suai.edu.ru/conference/zav-read/>



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