16th International Conference on
Electromechanics and Robotics
"Zavalishin's Readings"

ER(ZR)-2021

15th International Conference
"Vibration-2021.
Vibration technologies,
mechatronics and controlled machines"

6th International Conference
"Electric drive, electrical technology and
electrical equipment of enterprises"

Conference Programme

St. Petersburg, Russia
April 14-17, 2021

Zavalishin's Readings | 2021

SWSU SPC RAS SUAI USPTU Springer

Organizers

- St. Petersburg State University of Aerospace Instrumentation (SUAI, St. Petersburg, Russia)
- St. Petersburg Federal Research Center of the Russian Academy Sciences (SPC RAS, St. Petersburg, Russia)
- Southwest State University (SWSU, Kursk, Russia)
- Ufa State Petroleum Technical University (USPTU, Ufa, Russia)

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Keynote Lectures

Abolfazl Vahedi, Professor and Head of "Special Electric Machines and Drives" Laboratory, Iran University of Science and Technology, Tehran, Iran.

Lecture Title: Monitoring Condenser Bushings by Frequency Domain Spectroscopy (FDS) and Statistical approach.

Abstract: The dielectric frequency response (DFR) or the frequency domain spectroscopy (FDS) measures the tangent delta and insulation systems' capacitance over a wide frequency range. Due to the rich information that gives about insulation systems, nowadays, it is used for condenser bushings maintenance, especially moisture content detection in bushings' condenser core. However, it is still considered a new method for condenser bushings, and there is no standard method to interpret the results. Moreover, results interpretation is highly dependent on a human expert. It can be possible to set criteria for result interpretation using statistical indices. In this way, the human errors in the result interpretation process can be minimized.

Pavel Khlyupin, Director of the center for digital technologies and robotics, head of scientific and technical department, Associate professor of the department of electrical engineering and electrical equipment of enterprises Ufa state petroleum technical university, Ufa, Russia.

Lecture Title: Multi-function integrated electromagnetic component for renewable energy.

Abstract: The global trend is renewable "green" energy, the components of which should be as reliable and simple as possible. Device manufacturing technologies aim to optimize, reduce weight and size, and improve durability. Based on the multifunctional integrated electromagnetic element invented by S.G. Konesev, new types of generators for wave and wind power are being developed and researched. Also on the basis of MIEC, secondary power supplies are being developed for all types of renewable energy sources due to the fact that the created component can simultaneously perform the functions of an inductor (inductor), capacitor and transformer.

Victor Glazunov, Director of the Mechanical Engineering Research Institute of the Russian Academy of Sciences, St. Petersburg, Russia.

Lecture Title: Parallel structure manipulation mechanisms in robotic surgical systems and vehicle simulators.

Abstract: The article discusses the features of constructing manipulation mechanisms for surgical operations that ensure the constancy of the point of entry of the instrument into the working area. Three schematic diagrams of a manipulator for surgical operations have been developed. For promising additive technologies in conjunction with MSTU named Bauman, a five-axis technological robot of a parallel-sequential structure for spinal surgery is being developed. For training systems (simulators) that serve to train operators of ground and air vehicles, technical solutions have been developed that provide an imitation of movement on a slippery road or an imitation of a "spin".

Conference at a glance

Wednesday, April 14, 2021		
10:00-11:00	**Registration**	
11:00-16:00	Poster Session 1 & Poster Session 2 & Poster Session 3 (67, Bolshaya Morskaya St., St. Petersburg, Russia)	
Thursday, April 15, 2021		
10:00-10:30	**Opening Ceremony**	
10:30-11:00	**Keynote Lecture 1:** *Abolfazl Vahedi.* Monitoring Condenser Bushings by Frequency Domain Spectroscopy (FDS) and Statistical Approach. https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09	
11:00-11:30	Coffee break	
11:30-13:30	**Oral Session 1:** Electromechanics and Electric Power Engineering https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09	**Oral Session 2:** Electromechanics and Electric Power Engineering https://ams.rusoil.net/oau/meet?ePx0QguZM1wyRm7GZR3rr04VDSyD7onA&stud
13:30-14:30	Lunch break	
14:30-15:00	**Keynote Lecture 2:** *Pavel Khlyupin.* Multi-function Integrated Electromagnetic Component for Renewable Energy. https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09	
15:00-17:00	**Oral Session 3:** Electromechanics and Electric Power Engineering https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09	
Friday, April 16, 2021		
10:00-10:30	**Keynote Lecture 3:** *Victor Glazunov.* Parallel Structure Manipulation Mechanisms in Robotic Surgical Systems and Vehicle Simulators. https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09	
10:30-12:30	**Oral Session 4:** Robotics and Automation https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09	**Oral Session 5:** Robotics and Automation https://ams.rusoil.net/oau/meet?ePx0QguZM1wz4jA5ohU0b04VDSyD7onA&stud
12:30-13:00	Coffee break	
13:00-15:00	**Oral Session 6:** Robotics and Automation https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09	**Oral Session 7:** Robotics and Automation https://ams.rusoil.net/oau/meet?ePx0QguZM1wz4jA5ohU0b04VDSyD7onA&stud
15:00-15:30	**Closing Ceremony**	
Saturday, April 17, 2021		
11:00-15:00	**Social event**	

Conference Programme

Wednesday, April 14, 2021	
10:00-11:00	**Registration**
11:00-16:00	Poster Session 1 & Poster Session 2 & Poster Session 3 *(Campus of the St. Petersburg State University of Aerospace Instrumentation, 67, Bolshaya Morskaya St., St. Petersburg, Russia)*
Thursday, April 15, 2021	
10:00-10:30	**Opening Ceremony**
10:30-11:00	**Keynote Lecture 1:** *Abolfazl Vahedi.* Monitoring Condenser Bushings by Frequency Domain Spectroscopy (FDS) and Statistical Approach. https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09
11:00-11:30	Coffee break
11:30-13:30	**Oral Session 1:** Electromechanics and Electric Power Engineering https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09 *Nikolay Lopatkin.* Common-Mode Voltage Elimination of Three-Phase Multilevel Voltage Source Inverter by Means of Quarter-Wave-Symmetric Space Vector PWM Approach. *Antonina Dolgih and Vladimir Martemyanov.* Numerical Simulation of Speed-torque Characteristics of Tape Winding Electromotor. *Dmitry Ershov, Irina Lukjanenko, and Evgeny Zlotnikov.* Dynamic Properties of Technological Drive Operating in Acceleration Mode. *Sergey Eliseev, Andrey Eliseev, and Nikolai Kuznetsov.* System Representations of Dynamics of Mechanical Oscillatory Structures Based on Frequency Function and Damping Function. *Albert Khalikov, Ilgiz Yangirov, and Ruzil Safiullin.* Mathematical Model of the Electrothermal Process of Heating the Formation by the Ultra-Frequency Electromagnetic Waves. *Konstantin Krestovnikov and Aleksei Erashov.* Research of Performance Characteristics of WPT System Associated with Mutual Arrangement of Coils.
11:30-13:30	**Oral Session 2:** Electromechanics and Electric Power Engineering https://ams.rusoil.net/oau/meet?ePx0QguZM1wyRm7GZR3rr04VDSyD7onA&stud *Anton Yashin, Alexander Konev, and Marat Khakimyanov.* "Smart Well" Concept in Oil Production. *Hossein Taghizade Ansari, Abolfazl Vahedi, Pavel Khlyupin, and Nami Mahmoudi*. Diagnosis of Moisture Content in Oil-Paper Bushings Using Statistical Indicators Based on Frequency Domain Spectroscopy. *Elena Abidova, Artem Dembitsky, Alexander Lapkis, Irina Zarochintseva, and Alexander Chernov.* Processing NPP Electromechanical Equipment Diagnostic Signals Using Principal Component Analysis in Hardware-Software Complexes. *Tokhir Makhmudov and Obid Nurmatov.* Modernization of Automatic Excitation Control Systems of Generators in Syrdarya TPP. *Kahraman Allaev, Obid Nurmatov, and Tokhir Makhmudov.* Influence of Automatic Excitation Regulators on Modes of Hydropower Plants. *Eugene Soldatov and Aleksey Bogomolov.* Issues of Energy-efficient Storage of Fuel in Multimodal Transport Units. *Eugene Larkin, Aleksandr Privalov, Alexey Bogomolov, and Tatiana Akimenko.* Digital Control of Continuous Production with Dry Friction at Actuators.
13:30-14:30	Lunch break

14:30-15:00	**Keynote Lecture 2:** *Pavel Khlyupin.* Multi-function Integrated Electromagnetic Component for Renewable Energy. https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09
15:00-17:00	**Oral Session 3:** Electromechanics and Electric Power Engineering https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09
	Sergej Solyonyj, Alexander Rysin, Ilya Voropaev, Oksana Solenaya, and Maria Sozdateleva. Automated Product Life Cycle Control System. *Eleonora Zavoychinskaya.* On the Method for Estimation of Pipeline Durability Taking into Account of Technical Condition Diagnostic Results and Safety. *Ekaterina Cherskikh and Anton Saveliev.* Survey on Behavioral Strategies of Cyber-Physical Systems in Case of Loss of Integrity. *Vladimir Soldatkin, Vyacheslav Soldatkin, Galina Sokolova, Aleksandr Nikitin, and Elena Efremova.* Building, Forming and Processing of Signals of the Electronic Sensor Airspeed Vector's Parameters of Unmanned Aircraft Plane. *Alexander Gouskov, Grigory Panovko, and Alexander Shokhin.* Numerical Analysis of the Near-Resonant Vibrations of a Vibrating Technological Machine with Self-Synchronizing Unbalance Vibration Exciters. *Arta Mohammad Alikhani, Abolfazl Vahedi, and Pavel Khlyupin.* Induction Motor Fault Detection in ESP Systems based on Vibration Measurements.
Friday, April 16, 2021	
10:00-10:30	**Keynote Lecture 3:** *Victor Glazunov.* Parallel Structure Manipulation Mechanisms in Robotic Surgical Systems and Vehicle Simulators. https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09
11:30-13:30	**Oral Session 4:** Robotics and Automation https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09
	Sergey Jatsun, Andrey Malchikov, Andrey Yatsun, and Ekaterina Saveleva. Studying of Copying Control System with Nonlinear Measurer. *Viktor Glazunov, Gleb Filippov, Gagik Rashoyan, Lubov Gavrilina, Konstantin Shalyukhin, and Sergey Skvortsov.* Analysis of Mechanisms with Parallel-Serial Structure 5-DOF and Extended Working Area. *Vasily Pashchenko, Alexey Romanov, Maxim Chaikin, Vladimir Zakharov, Vasily Pashchenko, and Alexey Romanov.* Determination of Special Positions for Solving the Problem of Joint Relative Manipulation Mechanisms Kinematic Control. *Sergei Orekhov, Nikita Zaychikov, Konstantin Petrukhin, Alexander Tsepurkin, and Nikolay Tsepurkin.* Kinematic Modeling in Study of Manipulative Mechanism of Combined Movement. *Sergey Jatsun, Andrey Yatsun, Andrey Fedorov, and Ekaterina Saveleva.* Simulation of Static Walking in an Exoskeleton. *Aleksei Erashov and Konstantin Krestovnikov.* Algorithm for Controlling Manipulator with Combined Array of Pressure and Proximity Sensors in Gripper.
11:30-13:30	**Oral Session 5:** Robotics and Automation https://ams.rusoil.net/oau/meet?ePx0QguZM1wz4jA5ohU0b04VDSyD7onA&stud
	Jamil Safarov, Sergey Jatsun, Andrey Yatsun, and Sergey Knyazev. Simulation of Underwater Robot Autonomous Motion along Predetermined Straight Path. *Ildar Nasibullayev, Oleg Darintsev, and Dinar Bogdanov.* In-Pipe Modular Robot: Configuration, Displacement Principles, Standard Patterns and Modeling. *Oleg Darintsev and Ayrat Migranov.* Multi-criteria Optimization of the Mobile Robot Group Strategy Using the Ant Algorithm. *Rinat Galin, Mark Mamchenko, and Roman Meshcheryakov.* Analysis of the Allocation and Implementation of Tasks in the Heterogeneous Team of the Collaborative Robotic System. *Lev Kuznetsov, Polina Kozyr, and Dmitriy Levonevskiy.* Algorithm of Target Point Assignment for Robot Path Planning Based on Costmap Data. *Elizaveta Shmalko.* Feasibility of Synthesized Optimal Control Approach on Model of Robotic System with Uncertainties.

12:30-13:00	Coffee break
13:00-15:00	**Oral Session 6:** Robotics and Automation https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09
	Dmitry Dobrynin. Simulation of Trainable Control System for Quadruped Robot. *Sergey Jatsun, Oksana Emelyanova, Petr Bezmen, Andres Santiago, Martinez Leon, and Luis Miguel Mosquera Morocho.* Hardware/Software Architecture for Research of Control Algorithms of a Quadcopter in the Presence of External Wind Loads. *Igor Lebedev and Valeriia Izhboldina.* Method for Inspecting High-Voltage Power Lines Using UAV Based on the RRT Algorithm. *Alexander Denisov and Irina Vatamaniuk.* Algorithm for Calculating Coordinates of Repeaters for Combining Stationary and Mobile Devices into Common Cyber-Physical System. *Maksim Letenkov, Roman Iakovlev, and Alexey Karpov.* Approach to Image-based Recognition of User Face in Setting of Partial Face Occlusion by Personal Protective Equipment. *Denis Ivanko, Dmitry Ryumin, and Alexey Karpov.* Developing of a Software-Hardware Complex for Automatic Audio-Visual Speech Recognition in Human-Robot Interfaces.
13:00-15:00	**Oral Session 7:** Robotics and Automation https://ams.rusoil.net/oau/meet?ePx0QguZM1wz4jA5ohU0b04VDSyD7onA&stud
	Julia Rubtsova. Approach to Image-based Segmentation of Complex Surfaces Using Machine Learning Tools during Motion of Mobile Robots. *Egor Aksamentov and Valeriia Izhboldina.* Algorithm of Georeferencing and Optimization of 3D Terrain Models for Robot Path Planning. *Kirill Kononov, Roman Lavrenov, Lilia Gavrilova, and Tatyana Tsoy*. External RGB-D Camera Based Mobile Robot Localization in Gazebo Environment with Real-Time Filtering and Smoothing Techniques. *Konstantin Zakharov and Anton Saveliev.* Algorithm for Edge Detection of Floodable Areas Based on Heightmap Data. *Natalia Budko, Mikhail Medvedev, Artem Budko, and Raisa Budko.* Investigation of the Possibility of Vector-Command Control Based on Forearm EMG. *Nikita Nikiforov, Tatyana Tsoy, Ramil Safin, Yang Bai, Mikhail Svinin, and Evgeni Magid.* Pilot Studies on Avrora Unior Car-Like Robot Control Using Gestures.
15:00-15:30	**Closing Ceremony** https://zoom.us/j/94772484558?pwd=ZUNJOVU4NzhTdWdTYjN0QldsQnhidz09
Saturday, April 17, 2021	
11:00-15:00	**Social event**

Electronic Format of the Conference

In connection with the adoption of measures to prevent the spread of a new coronavirus infection, part of the International Conference "Zavalishin's Readings 2021" is held in electronic format. The teleconference will include speeches by leading scientists and discussion of scientific reports. During the conference, the changes are possible, so we ask the speakers to be in connection during all session. The conference website has a link to the registration page of teleconference participants:

Opening Ceremony, Keynote lectures, Closing Ceremony:
https://zoom.us/j/99282164653?pwd=Qlc0YVNMMEpFMTZuZ3JZbzQxTW9qdz09

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