

# **GLOBAL SMART INDUSTRY CONFERENCE (GloSIC'2020)**

South Ural State University  
November 17–19, 2020, Chelyabinsk  
(Chelyabinsk time, GMT+5)

The conference is supported by:  
South Ural State University, Chelyabinsk, Russia  
Emerson Electric Company  
IEEE Russia Siberia Section  
South Ural IEEE Chapter

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**November 17, 2020**

- 8:30-9:00 **REGISTRATION OF THE CONFERENCE PARTICIPANTS**  
("Sigma", hall of the 2nd floor)
- PLENARY SESSION**  
("Sigma", conference hall)  
Chair: Radchenko G.I.
- 9:00-9:15 **OPENING CEREMONY**
- 9:15-10:00 **New Horizons of Digital Transformation**  
Michael Train, Emerson Electric, USA
- 10:00-10:45 **Real Digitalization in Practice**  
Peter Zornio, Emerson Automation Solutions, USA
- 10:45-11:30 **Digital Twin and Its Industry Applications**  
Fei Tao, Beihang University, China
- 11:30-12:15 **Research of South Ural State University in Digital Industry**  
Aleksandr L. Shestakov, South Ural State University (national research university),  
Russia
- 12:15-13:30 **LUNCH BREAK**
- 13:30-14:00 **REGISTRATION OF THE CONFERENCE PARTICIPANTS**  
("Sigma", hall of the 2nd floor)
- PLENARY SESSION**  
("Sigma", conference hall)  
Chair: Zymbler M.L.
- 14:00-14:45 **The Learning Steel Plant: Merging Domain Knowhow with Artificial Intelligence and Performance-Based Business Models**  
Volker Bleischwitz, SMS digital GmbH, Germany
- 14:45-15:30 **Measurement for the Digital Industries: Challenges and Opportunities**  
Manus Patrick Henry, University of Oxford, United Kingdom
- 15:30-16:15 **Prediction of Sports Performance Using Biomechanics**  
Guillaume Laffaye, Université Paris-Sud, Université Paris-Saclay, France
- 16:15-17:00 **Cryptology in Pre- and Post-Quantum Times**  
Franck Leprevost, University of Luxembourg, Luxembourg

**November 18, 2020**

- 8:30-9:00 **REGISTRATION OF THE CONFERENCE PARTICIPANTS**  
("Sigma", hall of the 2nd floor)
- PLENARY SESSION**  
("Sigma", conference hall)  
Chair: Samodurova M.N.
- 9:00-9:45 **The 4. Industrial Revolution – Digital Solutions and Use Cases for the Metals Industry**  
Pino Tese, SMS group Inc., Germany
- 9:45-10:30 **Digital Technologies as a Way to Transform the Scientific Competencies of Universities into an Understandable Technology for Solving Everyday Problems of Industrial Enterprises. Considering the Service Interaction Model**  
Danila Tselikanov, Magnitogorsk Iron and Steel Works, Russia
- 10:30-11:15 **Predictive Maintenance for Small and Medium Enterprises in Industry 4.0**  
Vrinda Rastogi, Sahima Srivastava, Indira Gandhi Delhi Technical University for Women, India
- 11:15-12:00 **A MEMS Density-Viscosity Sensor Based on Electrostatically Actuation of a Comb-Drive Structure**  
Ghader Rezaszadeh, South Ural State University, Russia
- 12:00-13:30 **LUNCH BREAK**
- 13:30-14:00 **REGISTRATION OF THE CONFERENCE PARTICIPANTS**  
("Sigma", hall of the 2nd floor)
- PLENARY SESSION**  
("Sigma", conference hall)  
Chair: Shiryayev V.I.
- 14:00-14:45 **Digital Industry based on Digital Twins**  
Andrei I. Rudskoy, Peter the Great St.-Petersburg Polytechnic University, Russia
- 14:45-15:30 **Technical diagnostics and self-checking: development trends**  
Roald E. Taymanov, Ksenia V. Sapozhnikova, Mendeleev All-Russian Institute for Metrology, Russia
- SECTION A**  
(Zoom)  
Chair: Ivanov S.A.
- Virtual and augmented realities for Industry 4.0**
- 16:30-16:50 **The Tasks of Designing and Developing Virtual Test Stands**  
V.L. Averbukh, P. Vasev, I. Starodubtsev, N.V. Averbukh, I. Gajniyarov
- 16:50-17:10 **Problems Arising in the Design of Workstations Based on Augmented Reality**  
V.L. Averbukh, N.V. Averbukh, I. Gajniyarov
- 17:10-17:30 **Virtual Reality in Environmental Education for Manufacturing Sustainability in Industry 4.0**  
T. Krupnova, E. Yudina, O. Rakova, E. Shefer, A. Lut, A. Bulanova

- 17:30-17:50 **Development of the Software for Examination of the Crime Scene by Using Virtual Reality, Based on Spherical Panoramic Shot and 3D-Scanning**  
G. Rusman, E. Popova
- 17:50-18:10 **The Use of AR Elements in the Teaching of Mathematics at a Technical University**  
S.V. Akmanova, G.A. Kameneva, Y.A. Maznina, T.A. Bondarenko, L.V. Kurzaeva
- 18:10-18:30 **Repairability Assessment of Vehicle New Model Line-Up Using Modeling and Virtual Reality**  
I. Makarova, P. Buyvol, E. Mukhametdinov, V. Shepelev, A. Gritsenko, N. Kostyuchenkov

## **SECTION B**

(Zoom)

Chair: Sokolov A.N.

### **Cybersecurity in digital industry**

- 16:30-16:50 **Conceptual comparison of Port Community System and Blockchain Scenario for Maritime Document Handling**  
S. Tsiulin, K.H. Reinau, N. Goryaev
- 16:50-17:10 **Malicious Qr-Code Threats and Vulnerability of Blockchain**  
A. Averin, N. Zyulyarkina
- 17:10-17:30 **The Software Application for Increasing the Awareness of Industrial Enterprise Workers on Information Security of Significant Objects of Critical Information Infrastructure**  
L. Astakhova, I. Medvedev
- 17:30-17:50 **Model for Providing Information Security of APCS Based on Predictive Maintenance Technology**  
G.D. Asyaev, I.S. Antyasov
- 17:50-18:10 **Security Analysis of Wireless Sensor Networks Using SIEM and Multi-agent Approach**  
V. Vasilyev, R. Shamsutdinov
- 18:10-18:30 **Virtual Environment for Researching Information Security of a Distributed ICS**  
A. Barinov, S. Beschastnov, A. Boger, A. Kolpakov, M. Ufimtcev

## **SECTION C**

(Zoom)

Chair: Suhov M.V.

### **Sensors and their components**

- 16:30-16:50 **A Discrete Model of Acoustic Sensor**  
S. Nekrasov
- 16:50-17:10 **Digital Processing of the Ultrasonic Signal for Mobile Devices in the Transmission of Information**  
B. Saidov, V. Telezhkin

- 17:10-17:30 **Prototype of a Li-Fi Communication System for Data Exchange Between Mobile Devices**  
I.L. Kaftannikov, A.V. Kozlova, A.D. Khlyzov
- 17:30-17:50 **Development of a Wireless Pressure Transmitter with Diagnostics**  
E. Tugova, M.P. Henry, O. Bushuev, M. Motorina
- 17:50-18:10 **Modelling Fluid Loss Faults in an Industrial Pressure Sensor**  
K. Soltani, E. Tugova, M. P. Henry, O. Bushuev, M. Ghanbari, G. Rezazadeh
- 18:10-18:30 **Functional Measuring Generator with Pulse Current Stabilization**  
A.L. Galiev, N.I. Yumagulov, D.V. Topolsky

## **SECTION D**

(Zoom)

Chair: Yaparova N.M.

### **Cloud and high-performance computing for smart factory**

- 16:30-16:50 **Development of Supercomputer Model of Needle-Punched Felt**  
N.Yu. Dolganina, E.A. Teleshova, P.N. Semenikhina
- 16:50-17:10 **Development and Integration of a Mesh-Modifying Program Module into User's Interface of the Openfoam Software for High Performance Computing in the CM Field**  
D. Chitalov
- 17:10-17:30 **Research and Analysis of Unsteady-State Processes in Cloud Systems**  
A.I. Martyshkin, D.V. Pashchenko, D.A. Trokoz
- 17:30-17:50 **Simulation Modelling of Data Locking in a Distributed System**  
A.I. Martyshkin, D.V. Pashchenko, D.A. Trokoz
- 17:50-18:10 **Improving Parallel Computing Efficiency**  
V.N. Aleeva
- 18:10-18:30 **Matrix-Matrix Multiplication Using Multiple GPUs Connected by NVLink**  
Y.R. Choi, V. Nikolskiy, V. Stegailov

November 19, 2020

**SECTION A**

(Zoom)

Chair: Sidorov A.I.

**Condition monitoring and control for intelligent manufacturing**

- 10:00-10:20 **Development of Artificial Neural Network for Predicting Drill Pipe Sticking in Real-Time Well Drilling Process**  
S. Qodirov, A. Shestakov
- 10:20-10:40 **Effective Diagnostics of Metallurgical Equipment**  
S. Rednikov, E. Akhmedyanova, K. Akhmedyanova, D. Toymurzin
- 10:40-11:00 **Methodology of Development for the Resource Prognostic System of Sheet Mill Machinery**  
V. Golodov
- 11:00-11:20 **Application of the Coherent Spectrum Method with a Reference Signal in Problems of Diagnostics the State of Technical Equipment**  
A.N. Ragozin, A.D. Pletenkova
- 11:20-11:40 **Digital Program For Diagnosing The Status of a Power Transformer**  
I.E. Kolesnikov, A.V. Korzhov, K.E. Gorshkov
- 11:40-12:00 **Monitoring of Railway Infrastructure Objects with PHS-1 Photogrammetry System**  
E. Grigorova , E. Sartasov, B. Sukhovilov, S. Tushev
- 12:00-14:00 **LUNCH BREAK**

**SECTION B**

(Zoom)

Chair: Plotnikova N.V.

**Big data, machine learning and artificial intelligence for Industry 4.0 management**

- 10:00-10:20 **Modern Information Technologies and the Need for Improving the Quality of Organizational and Corporate Structures' Management**  
A.L. Shestakov, A.A. Maksimov, O.V. Loginovskiy, A.V. Hollay
- 10:20-10:40 **The Use of the YOLO Neural Network in the Task of Separating Vehicles and Pedestrians at a Signal-Controlled Intersection**  
O. Ibrjaeva, V. Shepelev, A. Zhulev, M. Chizhova, G. Yakupova, L. Fatikhova
- 10:40-11:00 **Automated System-Adviser Based on a Model for Control of the Technological Process of Concentrate Production**  
D.A. Shnayder, E.A. Kalinina
- 11:00-11:20 **Cleansing Sensor Data in Smart Heating Control System**  
M. Zymbler, Y. Kraeva, E. Latypova, S. Kumar, D. Shnayder, A. Basalaev
- 11:20-11:40 **Separation of Target Signal from Background Interference Using Convolutional Neural Network**  
M. Gubin
- 11:40-12:00 **Two-Dimensional Model of Compound Eye Imaging System**  
R. Fedyanina
- 12:00-14:00 **LUNCH BREAK**

## **SECTION C**

(Zoom)

Chair: Spicyn V.V.

### **Sensors and their components**

- 10:00-10:20 **Application of Genetic Algorithms for Construction of a Model of PLC in ICS Network Based on Observation**  
D. Komarov, N. Domukhovsky
- 10:20-10:40 **Numerical Method Processing Data Related with Dynamic Measurements**  
D. Yaparov, A. Shestakov
- 10:40-11:00 **Implementation of the Genetic Algorithm for Correcting the Dynamic Error of the Measuring Systems**  
E.V. Yurasova, A.C. Rusanova
- 11:00-11:20 **On the Question of Comparing the Forms Output Signals in Magnetostrictive Displacement Transducers Formed under the Influence Input Current Pulses Rectangular and Triangular Shapes**  
A.A. Vorontsov, Yu.N. Slesarev
- 11:20-11:40 **Model-Oriented Design of a Wireless Sensor Network**  
A.N. Kazimirov
- 11:40-14:00 **LUNCH BREAK**

## **SECTION A**

(Zoom)

Taranenko P.A.

### **Condition monitoring and control for intelligent manufacturing**

- 14:00-14:20 **The Algorithm of Electricity Consumption Control by Household Consumers Based on Smart Electricity Meters in the Republic of Tajikistan**  
A.I. Sidorov, S.S. Tavarov, O.A. Khanzhina
- 14:20-14:40 **Information Parameters Used in Protection when a 6-10 Kv Overhead Line Wire Breaks**  
A.M. Ershov, A.V. Khlopova, A.I. Sidorov
- 14:40-15:00 **Diagnostics of Drying Units with Microwave Emitter Units**  
S. Rednikov, E. Akhmedyanova
- 15:00-15:20 **Determination of the Parameters of an Induction Motor in Transient Modes to Improve the Quality of its Operation**  
V.S. Goun, A.A. Bakin, A.S. Anikin, N.Yu. Sidorenko
- 15:20-15:40 **Software and Hardware on the Platform of Standard Schneider Electric Devices that Implement Digital Correction of Frequency-Controlled Asynchronous Electric Drives**  
A. Baldenkov, V. Kodkin, N. Loginova
- 15:40-16:00 **A Digital Model for Evaluating the Thermal Behavior of Power Cable Couplings**  
I. E. Kolesnikov, A. V. Korzhov, K. E. Gorshkov



## **SECTION B**

(Zoom)

Chair: Zyulyarkina N.D.

### **Big data, machine learning and artificial intelligence for Industry 4.0 management**

- 14:00-14:20 **Realization Algorithms of Major Types of Linguistic Processors Based on the Systems with Predefined Semantics**  
A.N. Vanyulin, T.A. Lavina, N.R. Alekseeva, E.A. Zvereva, T.A. Mochalova
- 14:20-14:40 **Applying of Generative Adversarial Networks for Anomaly Detection in Industrial Control Systems**  
S.K. Alabugin, A.N. Sokolov
- 14:40-15:00 **Assessment of the Applicability of Autoencoders in the Problem of Detecting Anomalies in the Work of Industrial Control Systems**  
I.A. Pyatnisky, A.N. Sokolov
- 15:00-15:20 **The Detecting Cross-Site Scripting (XSS) Using Machine Learning Methods**  
S. Kascheev, T. Olenchikova
- 15:20-15:40 **Application of the Cycles Merging Algorithm to the Shortest Common Superstring Problem**  
Y.F. Leonova, A.V. Panyukov
- 15:40-16:00 **N-Dimensional Model for Visual Representation of Linear Programming Problem**  
N. Olkhovsky

## **SECTION C**

(Zoom)

Chair: Prokudina L.A.

### **Digital Twin technologies**

- 14:00-14:20 **Numerical Simulation of Parameters of Oscillatory Modes of an Oregonator Under External Influence**  
L. Prokudina, S. Turlakova
- 14:20-14:40 **Scalable Method for Linear Optimization of Industrial Processes**  
L.B. Sokolinsky, I.M. Sokolinskaya
- 14:40-15:00 **Digital Twin of City: Concept Overview**  
S.A. Ivanov, K.Yu. Nikolskaya, G.I. Radchenko, L.B. Sokolinsky, M.L. Zymbler
- 15:00-15:20 **Modeling as the Foundation of Digital Twins**  
O.G. Brylina, N.N. Kuzmina, K.V. Osintsev
- 15:20-15:40 **Interactive Visualization for Simulating the Movement of Liquids and Gases**  
A.G. Kriushichev, N.S. Silkina, E.A. Nenakhova
- 15:40-16:00 **Digital Twin of Air Pollution**  
A.A. Zamyshliaeva, D.A. Drozin, S.M. Elsakov, T.G. Krupnova, S.G. Nitskaya, T.Yu. Olenchikova

## **SECTION A**

(Zoom)

Chair: Taranenko P.A.

### **Condition monitoring and control for intelligent manufacturing**

- 16:00-16:20 **Learning and Control of Energy Consumption in Large Company**  
V. Tsyganov

- 16:20-16:40 **Learning of Quartering in Digital Control of Refit**  
V. Tsyganov
- 16:40-17:00 **Additive Noise Effect on the Error of Time Interval Forming**  
O.V. Prokofiev, A.E. Savochkin
- 17:00-17:20 **IoT-Based Approach for Industrial Equipment Condition Monitoring: Wireless Technology and Use Cases**  
V.V. Abdullin, D.A. Shnayder, A.R. Khasanov, D.F. Tselikanov
- 17:20-17:40 **Method for Determining the Thermal State of the Body During Complex Heat Treatment**  
N. Yaparova, Yu. Koryagin

## **SECTION B**

(Zoom)

Chair: Ivanova O.N.

### **Cybersecurity in digital industry**

- 16:00-16:20 **Comprehensive Classification of Internet Background Noise**  
M. Zolotykh
- 16:20-16:40 **Research of Behavior of the Search Engine ‘Shodan.Io’**  
M. Zolotykh
- 16:40-17:00 **Characteristics of a Random Vector Obtained Using Human-Computer Interaction**  
A. Averin, N. Zyulyarkina

## **SECTION C**

(Zoom)

Chair: Suhovilov B.M.

### **Industrial robotics**

- 16:00-16:20 **Evaluation of Positioning Accuracy of Manipulation Mechanism**  
N.V. Plotnikova
- 16:20-16:40 **A Distributed Algorithm of Control Software Processing for a Robotic Laser Welding Complex**  
S. Sukhorukov, S. Cherniy, R. Bazhenov, S. Bogatenkov, I. Borodin, O. Chuyko
- 16:40-17:00 **Robot Manipulator Control Using Predictive Model Under Conditions of Incomplete Information**  
V. Shcherbakov, A. Bragina, V. Shiryayev