

# **2018 25th International Workshop on Electric Drives: Optimization in Control of Electric Drives (IWED 2018)**

**Moscow, Russia  
31 January – 2 February 2018**



**IEEE Catalog Number: CFP18N62-POD  
ISBN: 978-1-5386-1201-9**

**Copyright © 2017 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP18N62-POD
ISBN (Print-On-Demand):	978-1-5386-1201-9
ISBN (Online):	978-1-5386-1200-2

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# TABLE OF CONTENTS

<b>MODEL PREDICTIVE DIRECT POWER CONTROL OF ROTOR SIDE CONVERTER FOR DFigs DRIVEN BY VARIABLE SPEED WIND TURBINES</b> .....	1
<i>Ahmed A. Zaki Diab</i>	
<b>SIMULATION OF SYNCHRONOUS RELUCTANCE MOTOR WITH DIGITAL CONTROL SYSTEM AND MAGNETIC FLUX ESTIMATOR</b> .....	7
<i>Vadim Kazakbaev ; Vladimir Prakht ; Vladimir Dmitrievskii</i>	
<b>THE IMPACT OF MODULATION TECHNIQUE ON HIGH POWER DENSITY SYNCHRONOUS MACHINE CHARACTERISTICS</b> .....	13
<i>Dmitry Golovanov ; David Gerada ; Galina Mirzaeva ; Chris Gerada</i>	
<b>COMPARATIVE STUDY OF FIELD-ORIENTED CONTROL MODEL IN APPLICATION FOR INDUCTION AND SYNCHRONOUS RELUCTANCE MOTORS FOR LIFE-CYCLE ANALYSIS</b> .....	19
<i>S. Autsou ; V. Saroka ; D. Karpovich ; A. Rassölkın ; L. Gevorkov ; T. Vaimann ; A. Kallaste ; A. Belahcen</i>	
<b>INTERPOLATION AND ANALYSIS OF THE EFFICIENCY OF A SYNCHRONOUS RELUCTANCE ELECTRIC DRIVE AT VARIOUS LOAD POINTS OF A FAN PROFILE</b> .....	24
<i>Nail Safin ; Vadim Kazakbaev ; Vladimir Prakht ; Vladimir Dmitrievskii ; Sergei Sarapulov</i>	
<b>ANALYSIS OF MOTION CONTROLLER REQUIREMENTS FOR PRECISION PLANAR MOTION SYSTEM WITH PARALLEL KINEMATICS</b> .....	29
<i>Dmitriy Elenskiy ; Mikhail Tiapkin ; Aleksandr Balkovoi ; Oleg Tolstykh</i>	
<b>OPTIMIZATION TASK DEFINITION OF DOUBLE INVERTER-FED MOTOR DRIVE BASED ON ENERGY CRITERIONS</b> .....	35
<i>Gennady Tutaev ; Maxim Bobrov</i>	
<b>MINIMIZATION AND REDISTRIBUTION OF SWITCHING LOSSES USING PREDICTIVE PWM STRATEGY IN A VOLTAGE SOURCE INVERTER</b> .....	42
<i>Alecksey Anuchin ; Dmitry Aliamkin ; Maxim Lashkevich ; Dmitry Shpak ; Alexandr Zharkov ; Fernando Briz</i>	
<b>MATHEMATICAL MODELING ULTRA PREMIUM EFFICIENCY (IE5 CLASS) PM ASSISTED SYNCHRONOUS RELUCTANCE MOTOR WITH FERRITE MAGNETS</b> .....	48
<i>Vladimir Prakht ; Vladimir Dmitrievskii ; Vadim Kazakbaev</i>	
<b>DESIGN OF A PORTABLE DRONE FOR EDUCATIONAL PURPOSES</b> .....	54
<i>Maximilian Hell ; Robert C. Bolam ; Yuriy Vagapov ; Alecksey Anuchin</i>	
<b>JOINT SPACE REFERENCE TRAJECTORY TO REDUCE THE ENERGY CONSUMPTION OF A SIX-LEGGED MOBILE ROBOT</b> .....	59
<i>Alexey Bodrov ; Weichen Cheah ; Peter N. Green ; Simon Watson ; Judith Apsley</i>	
<b>INTERNAL DESIGN OF PERMANENT-MAGNET IN-WHEEL MOTORS FOR BATTERY-POWERED TRACTION APPLICATIONS</b> .....	65
<i>John Paul Spivey ; Essam S. Hamdi</i>	
<b>GENETIC ALGORITHM OPTIMIZATION OF SHE-PWM TECHNIQUE FOR PARALLELED TWO-MODULE VSIS EMPLOYED IN ELECTRIC DRIVE SYSTEMS</b> .....	70
<i>Ahmed M. Omara ; M. Sleptsov ; Mohamed K. El-Nemr</i>	
<b>CALCULATION OF THE EFFICIENCY AND POWER CONSUMPTION OF INDUCTION IE2 AND SYNCHRONOUS RELUCTANCE IE5 ELECTRIC DRIVES IN THE PUMP APPLICATION BASED ON THE PASSPORT SPECIFICATION ACCORDING TO THE IEC 60034-30-2</b> .....	76
<i>Nail Safin ; Vadim Kazakbaev ; Vladimir Prakht ; Vladimir Dmitrievskii</i>	
<b>COMPARISON OF LINEAR POSITION AND VELOCITY CONTROL STRATEGIES FOR A DIRECT SERVODRIVE</b> .....	81
<i>E. K. Samygina ; L. N. Rassudov ; A. P. Balkovoi</i>	
<b>COMPARISON OF ELECTRICAL MACHINES FOR USE WITH A HIGH-HORSEPOWER MARINE ENGINE TURBOCHARGER</b> .....	86
<i>David Gerada ; Zeyuan Xu ; Dmitry Golovanov ; Chris Gerada</i>	
<b>QUASI-OPTIMAL ENERGY PATH PLANNING FOR ANTHROPOMORPHIC MANIPULATOR USING GRAVITY TORQUE MAPPING</b> .....	92
<i>Sang Beom Woo ; Alexey Bodrov ; Judith Apsley</i>	
<b>IMPROVING THE DYNAMIC RESPONSE OF FOC INDUCTION MACHINES OPERATED WITH REDUCED ROTOR FLUX</b> .....	98
<i>Alexander Popov ; Viktoriya Lapshina ; Igor Gulyaev ; Fernando Briz</i>	

<b>CASCADED FUZZY LOGIC BASED DIRECT TORQUE CONTROL OF INTERIOR PERMANENT MAGNET SYNCHRONOUS MOTOR FOR VARIABLE SPEED ELECTRIC DRIVE SYSTEMS</b> .....	102
<i>Ahmed M. Omara ; M. Sleptsov ; Ahmed A. Zaki Diab</i>	
<b>THERMAL MODELS BASED POWER MODULE TEMPERATURE MONITORING IN AC DRIVES</b> .....	108
<i>Mikhail Ilyin ; Alexander Popov ; Igor Gulyaev ; Fernando Briz</i>	
<b>APPLICATION OF ADAPTIVE NEURO FUZZY INFERENCE SYSTEM (ANFIS) CONTROLLER IN SERVODRIVE WITH MULTI-MASS OBJECT</b> .....	114
<i>Dmitry V. Lukichev ; Galina L. Demidova ; Aleksei Yu. Kuzin ; Aleksandr V. Saushev</i>	
<b>ULTRASONIC SENSOR FOR UAV FLIGHT NAVIGATION</b> .....	120
<i>David Gareth Davies ; Robert Cameron Bolam ; Yuriy Vagapov ; Peter Excell</i>	
<b>TORQUE CONTROL OF SWITCHED RELUCTANCE DRIVE IN GENERATING MODE</b> .....	127
<i>Mikhail Bychkov ; Artem Fedorenko ; Alexander Krasovsky ; Elena Gorbunova</i>	
<b>CROSSRAIL — LONDON'S NEW UNDERGROUND RAILWAY</b> .....	133
<i>Rhys Vaughan Williams ; Peter Excell</i>	
<b>DESIGN AND TESTING OF ELECTROMECHANICAL ACTUATOR FOR AEROSPACE APPLICATIONS</b> .....	142
<i>L. Papini ; P. Connor ; C. Patel ; L. Empringham ; C. Gerada ; P. Wheeler</i>	
<b>OPTIMUM AND QUASIOPTIMUM CONTROL OF THE POSITION ELECTRIC DRIVE BY CRITERION OF ELECTRIC LOSSES MINIMUM</b> .....	148
<i>Mikhail Bychkov ; Valentina Kuznetsova</i>	
<b>ESTIMATION OF THE REQUIREMENTS FOR HYBRID ELECTRIC POWERTRAIN BASED ON ANALYSIS OF VEHICLE TRAJECTORY USING GPS AND ACCELEROMETER DATA</b> .....	154
<i>Egor Kulik ; Xuan Trung Tran ; Alecksey Anuchin</i>	
<b>HIGH-SPEED GENERATOR WITH TOOTH-COIL WINDING, PERMANENT MAGNETS AND NEW DESIGN OF A STATOR MAGNETIC CORE MADE FROM AMORPHOUS ALLOY</b> .....	159
<i>F. R. Ismagilov ; V. E. Vavilov ; D. V. Gusakov ; Jing Ou</i>	
<b>OVERVOLTAGE PROTECTION FOR INTERIOR PERMANENT MAGNET SYNCHRONOUS MOTOR TESTBENCH</b> .....	164
<i>Hiep Duy Do ; Alecksey Anuchin ; Dmitry Shpak ; Alexandr Zharkov ; Anatoliy Rusakov</i>	
<b>CALCULATION OF THE TRACTION EFFORT OF ISEAUTO SELF-DRIVING VEHICLE</b> .....	168
<i>A. Rassõlkin ; L. Gevorkov ; T. Vaimann ; A. Kallaste ; R. Sell</i>	
<b>OPTIMISATION IN SERVO MOTION CONTROL: CONSIDERING HARDWARE CONSTRAINTS</b> .....	173
<i>L. N. Rassudov ; A. P. Balkovoi</i>	
<b>SIMULINK BASED MODEL FOR FLOW CONTROL OF A CENTRIFUGAL PUMPING SYSTEM</b> .....	178
<i>Levon Gevorkov ; Anton Rassõlkin ; Ants Kallaste ; Toomas Vaimann</i>	
<b>IMPACT OF LOW SWITCHING-TO-FUNDAMENTAL FREQUENCY RATIO ON PREDICTIVE CURRENT CONTROL OF PMSM: A SIMULATION STUDY</b> .....	182
<i>Leszek Jarzebowicz</i>	
<b>MODELING OF TWO-TROLLEYBUS MOTION WITH BRAKING ENERGY EXCHANGE AND TRANSMISSION RESISTANCE</b> .....	187
<i>Girts Stana ; Viesturs Brazis</i>	
<b>Author Index</b>	