

2023 14th International Symposium on Linear Drivers for Industry Applications (LDIA 2023)

**Hannover, Germany
28-30 June 2023**



**IEEE Catalog Number: CFP2386V-POD
ISBN: 979-8-3503-2962-9**

**Copyright © 2023 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:	CFP2386V-POD
ISBN (Print-On-Demand):	979-8-3503-2962-9
ISBN (Online):	979-8-3503-2961-2

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
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

Proposal for Estimation of the Vertical Center of Gravity and the Decoupling Control with 2-DoF for a Maglev Linear Conveyor <i>Yueying Yang, Wataru Ohnishi, Takafumi Koseki</i>	1
Influence of Split Teeth on the Performance of Linear Permanent Magnet Vernier Motor <i>Hui Wang, Yanxin Li, Zijun Cui, Qinfen Lu</i>	6
Detent-Force Analysis and Reduction of Modular Permanent-Magnet Linear Synchronous Motors with Non-overlapping Windings <i>Lize Wu, Yanxin Li, Qinfen Lu, Youtong Fang</i>	11
A Study on the Control of Linear Conveyor Module <i>Xudong Wang, Jiale Xu Author, Shuhua Wang, Yan Sun, Yuanxu Xin, Yuanjiang Liu</i>	16
A Suppressing Impact Current Method with Symmetrical Switching for Segmented Linear Motor <i>Chengtang Deng, Fei Xu, Zixin Li, Liming Shi, Yaohua Li, Xu Wu</i>	20
Noise Reduction for Sub-Nanometer Position Stability in High Dynamic Linear Drives..... <i>Markus Märkl, Rainer Hagl, Marcelo Heldwein</i>	24
Online Maximum Torque Per Total Ampere Control for Nest-Loop Secondary Linear Doubly-Fed Machine Considering Static End Effect..... <i>Zhen Bao, Jian Ge, Wei Xu, Yaping Zhang, Yanxin Li, Qinfen Lu</i>	29
Vibration Control of Structures by Mass Variation Using Magnetic Levitation..... <i>Satoshi Ueno, Keigo Fujimoto, Chengyan Zhao</i>	34
Embedded Absolute Position Detection for Permanent Magnet Linear Motors with Passive Track..... <i>Florian Poltschak, Richard Haider</i>	38
A Moving Magnet Type Linear Synchronous Motor with No End-Effect..... <i>Hiroto Yamaguchi, Mimpei Morishita</i>	42
Design of a Linear Synchronous Reluctance Motor with Concentrated Windings..... <i>J. I. H. Van Hekke, D. C. J. Krop, B. J. H. De Bruyn, E. A. Lomonova</i>	47
A Multi-Step Model Predictive Direct Thrust Control Method for Linear Synchronous Motors Driven by Three-Level NPC Inverters..... <i>Yadong Hu, Ke Wang, Qi Wang, Jin Wang, Dihui Zeng, Yaohua Li</i>	52
Electromagnetic Analysis of Linear-Rotary Two-degree-of-freedom Tubular Generator for Wave Power Generation <i>Linsen Wang, Qinfen Lu, Yanxin Li</i>	56
Hall-Effect Sensor Based Position Sensor for Force Control of a Bendable Tubular Linear Motor <i>Florian Dreishing, Christian Kreischer</i>	61
Linear Induction Motor (LIM) Integrated Propulsion and Levitation MAGLEV Via Ladder Type Passive Track..... <i>Ileana Torac, Lucian Tutelea, Ion Boldea</i>	65
MagLev ² -Cobra Linear Drive Harnessing Attraction Forces <i>R. A. H. Oliveira, R. M. Stephan, E. F. Rodriguez, G. K. Messer</i>	70

Real-Time Modeling of Segmented Multiphase Linear Motor with Thyristor and Neutral Connection During the Switching Process	74
<i>Xu Wu, Fei Xu, Zixin Li, Liming Shi, Yaohua Li, Chengtang Deng</i>	
Aerodynamic Bearing-Equipped High-Speed PM Motor with Auxiliary Levitation and Extra Torque.....	78
<i>Jian-Xin Shen, Kai Luo, Ruizhen Cui, Dan Shi, Yun-Chong Wang</i>	
Practical Numerical Modeling Approach for a Design of a Two-Dimensional Linear Synchronous Actuator	83
<i>Noriaki Ito, Takafumi Koseki, Wataru Ohnishi, Yuichiro Nakamura, Kenji Takahashi, Hiroyuki Sekiguchi</i>	
Performance Evaluation of a Capacitor-Self-excited Linear Eddy Current Brake for Railway Vehicles	88
<i>Keigo Ukita, Yasuaki Sakamoto, Mitsuhide Sato, Tsutomu Mizuno</i>	
Design Optimization of a Linear Wound Field Flux Switching Machine for Dry Gravity Energy Storage.....	92
<i>Morris Mugyema, Maarten J. Kamper, Rong-Jie Wang</i>	
Research on Cylindrical Linear Induction Motor for Drive Mechanism.....	97
<i>Xu Niu, Tianda Yu, Lu Zhang, Qingzhao Li, Siyu Huang, Yanting Liu, Hao Wu, Yuan Tang</i>	
High-Performance Sensorless Control Strategy of High-speed Maglev Based on Nonlinear Extended State Observer and Improved Phase Lock Loop	102
<i>Hongyun Sang, Ruihua Zhang, Qiongxuan Ge, Xueqian Cao</i>	
An Unconventional Approach to Cogging Force Reduction in Linear Motors	108
<i>Florian Poltschak, Richard Haider</i>	
Permanent Magnet Linear Synchronous Motor Mover Position Estimation at Zero and Low Speed Using Eddy Current Loss Equivalent Resistance	112
<i>Zhenhao Huang, Yanxin Li, Qinfen Lu</i>	
Characteristics Verification of Simultaneous Propulsion and Levitation Control of a Linear Induction Motor by Dual Frequency Superimposed Drive.....	117
<i>Akihiro Tomai, Akiho Onoue, Toshimitsu Morizane, Hidehito Matayoshi</i>	
Scaling of a Magnetically Levitated Moving-Magnet Planar Motor Based on Payload and Pole Pitch.....	122
<i>B. J. A. Kuijpers, J. W. Jansen, E. A. Lomonova</i>	
Discrete Resonant Controller Based Current Harmonics Suppression for Dual Three-Phase Linear Induction Motor.....	127
<i>Ganlin Kong, Liming Shi, Jinhai Liu, Shijiong Zhou, Xueqian Cao, Yaohua Li</i>	
Damping Characteristics of Magnetic Levitation Using Bulk Superconductors and Permanent Magnets	132
<i>Hiroyuki Ohsaki, Satsuki Okumura, Fumiya Harashima</i>	
Calculation of Eddy Current Loss in Permanent Magnets of a Linear Hybrid Stepper Motor for a Conveyor System	136
<i>Max Hullmann, Bernd Ponick</i>	

Design and Analysis of Magnetic Field Modulation Magnetic Lead Screw for Wave Power Generation	139
<i>Yuan Li, Lei Huang, Minshuo Chen</i>	
Design of a Magnetic Lead Screw with Discretized PMs for Wave Power Generation	144
<i>Yuan Li, Lei Huang, Minshuo Chen</i>	
Modelling, Control and Position Estimation for Linear Permanent Magnet Actuators	148
<i>Ali El Hafni, Wei Tian, Ralph Kennel, Marcelo Lobo Heldwein</i>	
Global Optimization of a Complementary and Modular Linear Flux-Switching Permanent Magnet Motor Applied for Urban Rail Transit to Reduce Normal Force	153
<i>Qi Wang, Ke Wang, Yadong Hu, Dihui Zeng, Jin Wang</i>	
Hysteresis Modelling and Coercivity Mechanisms in Hard Ferrites	157
<i>Marcos F. De Campos, Fernanda A. Sampaio Da Silva, Sergio A. Romero, José A. De Castro</i>	
Using an Analytic-Based Magnetic Charge Fourier Series Model to Study a Magnetic Lead Screw When Operating as a Magnetic Spring	162
<i>Mojtaba Bahrami Kouhshahi, Jonathan Z. Bird</i>	
Active Magnetic Levitation Bearing Optimization and Dynamic Evaluation for a Hemocompatibility Assessment Platform.....	166
<i>Victor Tedesco V, Nobuyuki Kurita, O. H. Frazier, Yaxin Wang</i>	
Electromagnetic Design Aspects of a Dynamic Inductive Power Transfer System Made of Precast Concrete Elements.....	170
<i>Jan Rickwärtz, Svetomir Stevie, Frederic Otto, Johann Kolb, Michael Niedermeier, Robert Grajcarek, Kay Hameyer</i>	
Design and Simulation of the Electrodynamic Suspension of an Hyperloop Test Vehicle	175
<i>Maude Fumeaux, Maxence Cailleteau, David Melly, Samuel Chevailler, Joël Cugnoni</i>	
Comparison of Track Topologies of Permanent Magnet Electrodynamic Suspensions	180
<i>Louis Beauloye, Bruno Dehez</i>	
Studying the Peak Force of Magnetic Linear Motion Devices Using Dimensional Neutrality	185
<i>Mojtaba B. Kouhshahi, Jonathan Z. Bird</i>	
Latency Optimization of Magnetic Actuator for Optics Manufacturing.....	189
<i>Berend Denkena, Heinrich Klemme, Jingcai Zhang</i>	
Multicriteria Design of an Electromagnetic Hammer.....	193
<i>Maurizio Repetto, Luca Dimauro, Elvio Bonisoli</i>	
Control of a Dual-Stage Positioning System Consisting of Two Permanent Magnet Linear Motors for High-Precision Applications	198
<i>Franz Luckert, Kay-Horst Dempewolf, Axel Mertens</i>	

Author Index