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Online
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Conference program

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Monday, September 26, 2022

19:00 - 19:40 Opening Ceremony

Chair: Liang Ding

Welcome by Conference Chair: Liang Ding

Welcome by Zhiwu Han, Executive Director of Chinese Society for Agricultural Machinery

President Address: Corina Sandu

Report on Journal of Terramechanics: Corina Sandu for Vladimir Vantsevich

19:40 - 19:45 5-minute break

19:45 - 20:35 Plenary — Keynote

Chair: Lutz Richter

Locomotion and Exploration of Zhurong Mars Rover

Baofeng Yuan

Chief designer of the Zhurong Mars Rover mobility system | China Academy of Space Technology

20:35 - 20:45 10-minute break

20:45 - 22:30	Session 1-1-A Best Paper Candidates	Session 1-2-A Mobility and Traction Characterization I	Session 1-3-A Control, Planning and Estimation I
	Time: 20:45 - 21:25 Chair: Péter Kiss Co-Chair: Dror Rubinstein	Time: 20:45 - 21:35 Co-Chair: Meng Zou Chair: Chen Li	Time: 20:45 - 21:35 Chair: Parish Nalavade Co-Chair: He Kong
	Acquisition of Flipper Motion of Tracked Robot in Step-Climbing Using Reinforcement Learning Ryosuke Eto, Junya Yamakawa 9913	A Wheel and Vehicle Mobility Index Based on Traction and Velocity for Optimization of Mobility Performance Vladimir Vantsevich, David Gorsich, Jesse Paldan, Masood Ghasemi, Lee Moradi 0963	Semi-active Reinforcement Learning Suspension Control for the Off-road Vehicles Ye Zhuang, Haojie Sun, Yingchun Qi, Weiguang Fan, Hui Ye 1128
	Research on Drag Reduction Performance of Sliding Plate of Rice Direct Seeding Machine Based on Non-smooth Structure of Loach Surface Hongchang Wang, Zhen Jiang, Kaiquan Ding, Guozhong Zhang, Abouelnadar Salem, Yuan Gao 5979	A Comprehensive Lumped Parameter Approach for the Dynamic Simulation of Agricultural Tractors in Real Operating Conditions Marco Polastri, Damiano Chiarabelli, Silvia Gessi, Massimo Martelli, Emiliano Mucchi, Pietro Marani 2034	Foothold Selection Considering Constraint and Slippage Evaluation for Legged Robots Yufei Liu, Lei Jiang, Chong Tian, Boyang Xing, Zhirui Wang, Bo Su, Tong Yan, Liang Ding, Haibo Gao 1534
	Factors Affecting Bevameter Soil Characterization Schalk Els, Herman Hamersma, Ray Kruger 6174	Investigation of the Shear Stress Dynamics on Silty Loam Soil and Measurement of Traction-Wheel Slip Relationship of a Tractor Tire César Andrés Arévalo-Montaña, Stefan Böttinger 2149	Model Predictive Control of a Robot Driven Vehicle for Testing of Advanced Driver Assist Systems Mike Huang, Qiu Haixuan, Yang Chunyu, Xia Lian, Lin Zhaomin, Wang Yanqing, Xu Zongqing, Mingfu Tang 2539
		Research on High Traction Bionic Wheel Based on Traction Characteristics of Jerboa Foot Hao Pang, Liangliang Zhao, Huailiang Wang, Rui Zhang 2681	Energy Consumption Analysis of Door Opening with a Mobile Manipulator in the Nuclear Power Plants Changyou Ma, Binbin Yan, Xu Xiong, Haibo Gao, Liang Ding 2632
		The Running Gear Construction Impact on Obstacles Overcoming by Light High-Mobility UGV Daniela Szpaczyńska, Marian Łopatka, Piotr Krogul 4260	An Improved Simultaneous Localization and Mapping Method Based on LeGO-LOAM and Motion Compensation Mengyang Li, Xinsheng Wang, Xiyue Wang, Shuang Liu 2643

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The Effect of Integrating a Bio-inspired Convex Structure with a Low-Surface Energy Polymer on Soil Adhesion and Friction Abouelnadar Salem, Guozhong Zhang, Hongchang Wang 8349	Steadily Learn to Drive with Virtual Memory Yuhang Zhang, Yao Mu, Shengbo Li, Yangang Ren, Liye Tang, Yujie Yang, Chen Chen 4774	Obstacle Avoidance of Mobile Robots Using Modified Artificial Potential Field Algorithm Based on Vortex and PID Adjustment Zhuoran Sheng, Song Wang 3004 (Abstract only)
A Time Domain Passivity Controller for Teleoperation of Four-Wheeled Differential Mobile Robot on Slippery Surface Hui Xi, Yanjing Li, Pengyu Sun, Weihua Li, Jianfeng Wang 7092	Research on Vehicle Running Performance on Paved Roads Covered with Falling Volcanic Ash Junya Yamakawa, Ryosuke Eto, Yasuhiro Ichikado, Mitsuhiro Yoshimoto, Tatsuji Nishizawa, Tomohiro Kubo, Hiroyuki Yamada 6718	Perceptive Locomotion of Legged Robot Coupling Model Predictive Control and Terrain Mapping Boyang Xing, Lei Jiang, Bo Su, Yufei Liu, Zhirui Wang, Tianqi Qiu, Jianxin Zhao 6316
Study of Passive Steering Mechanism for Mars Surface Exploration Rovers Asahi Oe, Shin-Ichiro Nishida, Shintaro Nakatani 7233	Vehicle Dynamic Factor Characterized by Actual Velocity and Combined Influence of the Transmission and Driveline System Vladimir Vantsevich, David Gorsich, Jesse Paldan, Jordan Whitson, Brian Butrico, Oleg Sapunkov 7199	Study of Passive Steering Mechanism for Mars Surface Exploration Rovers Vehicle Dynamic Factor Characterized by Actual Velocity and Combined Influence of the Transmission and Driveline System Research on Energy-Saving Underactuated Bionic Biped Robot Youhao Diao, Zhiqiang Zhuang, Xuebo Wang 7349 (Abstract only)
Parameters Calibration of Red Clay Soil in Hilly Area of Southwest China for Discrete Element Simulation Based on Repose Angle Test Le Yang, Qinghui Lai, Liangliang Zhao, Peihang Li, Zhihong Zhang, Zhaoayang Chen 8131	Determination of the Necessary Indicators of Vehicles and the Movement Surface for Calculating the Mobility Criterion Alina Markovkina, Umar Vakhidov, Vladimir Belyakov, Vladimir Makarov 8104	
Design and Verification of a Creeping Mars Rover Wangjun Zhang, Yang Jia, Zhuo Tao 1491	Force Chain Analysis on Wheel-Soil Interaction Using Photoelastic Method Yuto Yoshida, Sota Yuasa, Kenji Nagaoka 9273	
A Review of Modeling and Validation Techniques for Tire-Deformable Soil Interactions Varsha S Swamy, Rashna Pandit, Alba Yerro-Colom, Corina Sandu, Denise Rizzo, Katherine Sebeck 7018		

Tuesday, September 27, 2022

19:00 - 19:10 **Welcome**

Chair: Liang Ding

19:10 - 20:00 **Plenary — Keynote**

Chair: Corina Sandu

Agriculture Robotics—Mechatronic and AI Design for All Terrain Operations
Salah Sukkarieh

Professor, Robotics and Intelligent Systems, University of Sydney | Sydney Institute of Agriculture | The University of Sydney Nano Institute | the Charles Perkins Centre | CEO of Agerris

20:00 - 20:05 **5-minute break**

20:05 - 20:55 **Plenary — Keynote**

Chair: Lutz Richter

Development of a Biologically Inspired Walking Robot for Mars Exploration
Guangming Chen

Instructor, School of Mechanical and Electrical Engineering, Nanjing University of Aeronautics and Astronautics
Institute of Bio-Inspired Structure and Surface Engineering

20:00 - 20:05

5-minute break

21:05 - 22:30

**Session 2-1-A
Robotics and Space Applications I**

Time: 21:05 - 21:45
Chair: Huaiguang Yang
Co-Chair: Jiayu Li

Analysis on Climbing Mode of Zhurong Rover

Zhen Chen, Meng Zou, Dong Pan, Baofeng Yuan, Lining Chen | 0196
(Abstract only)

Review on the Reconfigurable Wheel-Tracked System

Jiaxuan Wang, Cheng Liu, Wei Wei, Qingdong Yan | 0861

Bearing Capacity Analysis of Bionic Walking Wheel for Manned Lunar Rover

Rui Zhang, Liang Liang Zhao, Yupei Du, Bin Zhao, Hao Pang, Lige Wen, Weijun Wang, Hua Zhang, Zhenyu Hu, Meng Zou | 2928
(Abstract only)

Why We Need Alternative Ground Robots to Traverse Sandy and Rocky Extraterrestrial Terrain, and How We Can Progress Towards Them

Chen Li, Kevin Lewis | 3290
(Abstract only)

**Session 2-2-A
Modeling and Simulation I**

Time: 21:05 - 21:45
Co-Chair: Schalk Els
Chair: Zhenzhong Jia

Modeling of Lunar Rover Vehicle Wheel-Soil Interaction Using FEM-DEM Method

Kaidi Zhang, Yunqing Zhang, Junwei Shi, Weili Kong | 1655

Tyre Parameterization Tests: Dynamic Vs. Static

Carl Becker, Schalk Els | 2190

Modeling Tire-Soil Compression Resistance on Artificial Soil Using a Scaling Law of Pressure—Soil Sinkage Relationship

Pius Jagwe, Mehari Tekeste, Nisreen Alkalifa | 2398
(Abstract only)

**Session 2-3-A
Modeling and Simulation III**

Time: 21:05 - 21:45
Chair: Junya Yamakawa
Co-Chair: Kyeong Uk Kim

Numerical Analysis of Multi-Pass Effect Based on the Extended Terramechanics Theory

Shingo Nakano, Shingo Ozaki | 5636
(Abstract only)

Interaction Modeling and Dynamic Control Strategy for C-Shaped Leg with Sandy Terrain in Terradynamics

Chuanxiao Yang, Zhiyue Xin, Xiong Hu, Shibin Sun, Liang Ding, Dewei Tang | 5800

Tire-Soil Tangential Force Reinforcement Learning Modelling

Yingchun Qi, Jiaqi Zhao, Ye Zhuang | 7399

Modelling of the Shear Displacement for Tracked Vehicles in Transient Maneuvers

Yang Jiao, Jozsef Kovacsics | 7739
(Abstract only)

**Session 2-1-B
Robotics and Space Applications II**

Time: 21:50 - 22:30
Chair: Huaiguang Yang
Co-Chair: Jiayu Li

Field Validation of Egress Process for Planetary Rover

Dang Zhaolong, Chen Baichao | 4054

Development and Traveling Performance Analysis of Driving Test Rover in Sandy Terrain

Masataku Sutoh, Yuji Katsumata, Sachiko Wakabayashi | 4170
(Abstract only)

Development and Demonstration of Robotic Investigation Tool for Terrain Mechanical Property

Yuzuki Morita, Genya Ishigami | 4323
(Abstract only)

**Session 2-2-B
Modeling and Simulation II**

Time: 21:50 - 22:30
Co-Chair: Schalk Els
Chair: Zhenzhong Jia

Terramechanics Model Augmentation Using Machine Learning

Eric Karpman, Jozsef Kovacsics, Marek Teichmann | 2960
(Abstract only)

DEM Analysis of the Dynamics of Granular Media Considering with Interparticle Forces under Low Gravity Condition

Takuru Nishino, Kenta Takase, Shingo Ozaki, Takao Maeda, Mitsuhsa Baba, Masatsugu Otsuki | 4136
(Abstract only)

Multi-Fidelity Machine Learning Modeling for Wheeled Locomotion on Soft Soil

Vladyslav Fediukov, Felix Dietrich, Fabian Buse | 4812

**Session 2-3-B
Modeling and Simulation IV**

Time: 21:50 - 22:30
Chair: Junya Yamakawa
Co-Chair: Kyeong Uk Kim

A Method for Fast Obtaining of Soil Shear Strength Index Based on DEM Free-Fall Cone Penetration Simulation

Jincheng Diao, Jingwei Gao, Xiaobo Song, Baojun Di | 7878

A High-Fidelity Dynamics Simulation Method for Legged Robot Based on Foot-Terrain Interaction Model

Jianghua Ge, Jianghu Wu, Xiaofei Zhu | 8362
(Abstract only)

Examining the Simulation-to-Reality Gap of a Wheel Loader Interacting with Deformable Terrain

Koji Aoshima, Daniel Lindmark, Martin Servin | 9092
(Abstract only)

Terrain Classification Using Mars Raw Images Based on Deep Learning Algorithms with Application to Wheeled Planetary Rovers

Junlong Guo, Xingyang Zhang,
Yunpeng Dong, Zhao Xue,
Bo Huang | 4744

3D-DEM Simulation and Post-Process Method of Wheel-Terrain Interaction for Planetary Rovers

Qingning Lan, Zhengyin Wang,
Huaiguang Yang, Liang Ding,
Haibo Gao | 9352

Wednesday, September 28, 2022

19:00 - 19:10 **Welcome**

19:10 - 20:00 **Plenary — Keynote**

Chair: Massimo Martelli

Semi-active Reinforcement Learning Suspension Control for Off-road Vehicles

Ye Zhuang | on behalf of FISITA

Professor | State Key Lab of Automotive Simulation and Control, College of Automotive Engineering | Jilin University

20:00 - 20:10 **10-minute break**

20:10 - 21:25

**Session 3-1-A
Soil and Ground Testing and Characterization I**

Time: 20:10 - 20:50
Chair: Taizo Kobayashi
Co-Chair: Junlong Guo

Composite Beam Tests with Closed Cell Polyurethane and Aluminum Foam

George Mason, Ethan Salman, Shiraz Mujahid | 0303

Benchmarking of Compression Testing Devices in Snow

Mohit Nitin Shenvi, Corina Sandu, Costin Untaroiu | 3351

Soil Compaction Monitoring Technique Using Deep Learning

Shota Teramoto, Taizo Kobayashi | 4243

Experimental Study of Track-Soil Interactions of the Steering Performance of Tracked Robots over Soft Deformable Terrains

Qiaowen Wang, Zhenzhong Jia | 4782 (Abstract only)

**Session 3-1-B
Soil and Ground Testing and Characterization I**

Time: 20:55 - 21:25
Chair: Taizo Kobayashi
Co-Chair: Junlong Guo

**Session 3-2-A
Design I**

Time: 20:10 - 20:50
Co-Chair: Linnea Hansson
Chair: Mehari Tekeste

Design and Simulation Analysis of Intelligent Suspension for Manned Lunar Rover

Tao Li, Chongfeng Zhang, Weijun Wang, Junwei Shi | 0356

Comparative Analysis of Hydrodynamical Efficiency of Full-submerged Archimedes Screws of Rotary-Screw Propulsion Units of Snow and Swamp-Going Amphibious Vehicles with Single and Tandem Propulsor Design

Svetlana Karaseva, Aleksey Papunin, Vladimir Makarov, Dmitry Malahov | 1704 (Abstract only)

Design of Self-driving Bulldozer System

Yang Junhua, Zhang Biao, Tang Haokai, Shen Binghua, Ou Linlin, Yu Xinyi, Feng Yuanjing, Feng Yu, Zhou Libo | 4409

Introducing Polibot: A High Mobility Tracked Robot with Innovative Passive Suspensions

Giulio Reina, Rocco Galati, Andrea Grazioso, Angelo Ugenti, Giacomo Mantriota | 4827

**Session 3-2-B
Design I**

Time: 20:55 - 21:25
Co-Chair: Linnea Hansson
Chair: Mehari Tekeste

**Session 3-3-A
Soil and Ground Testing and Characterization II**

Time: 20:10 - 20:50
Chair: Vilas M. Salokhe
Co-Chair: Genya Ishigami

Ride Comfort Comparison between Suspension Modes: Input towards Designing Difference Threshold Experiments during Driving

Cor-Jacques Kat, Kylian Praet, Miguel Dhaens, Schalk Els | 5408

Nonparametric Terrain Estimation Based on the Interaction Simulation between Planetary Penetrator and Soil

Xintao Yang, Han Huang, Zhixin Xiang, Qinghao Yan, Haozhe Wang, Shuai Xu | 6796

Construction of a Soil Clods Recognition Bench-Scale Experiment for Discrete Element Method Modeling of Tilling Phenomena

Shuto Ishii, Isami Suto, Hiroaki Tabe, Keisuke Nagato, Moju Zhao, Yoshifumi Ueshige, Takashi Iritani, Masayuki Nakao | 8654

Investigation of the Relationship between the Cone Index and the Physical and Mechanical Parameters of the Soil of Typical Surfaces of the Movement of Agricultural Tractors and Machines

Sergey Zhukov, Vladimir Makarov, Vladimir Belyakov | 8658

**Session 3-3-B
Soil and Ground Testing and Characterization II**

Time: 20:55 - 21:25
Chair: Vilas M. Salokhe
Co-Chair: Genya Ishigami

	Bionic Quadruped Robot for Mars Surface Exploration	Research on Bionic Anti-skid Tires Suitable for Icy and Snow-Covered Roads	Prominent Problems and Thoughts of "Paddy Soil-Terrain Machine System" Based on Disturbed Saturated Paddy Soil Conditions in South China
	Long Qiao, Guangming Chen, Lutz Richter, Aihong Ji 5060	Rui Zhang, Yu Han, Hao Pang 5943 (Abstract only)	Guozhong Zhang, Hongchang Wang, Jun Du, Kaiquan Ding, Wanru Liu, Nanrui Tang, Yong Zhou 1561
	Penetration Dynamics of Asteroid Exploration Landing Based on DEM	Design and Testing of Parallel Embedded Six-Axis Force Sensors for Paddy Walking Wheels	Experimental Analysis and Numerical Modeling of Bulldozing Force with Varied Soil Moisture Content
	Yongbin Wang, Shiqing Wu, Shutong Chen, Xinghua Liu, Huan Liu, He Jia, Xuyan Hou, Shaomin Liang, Shunying Ji, Zijian Zhang 9219 (Abstract only)	Zaiman Wang, Jianfei He, Erli Zhang, Miao Su, Yue Huang, Wenwu Yang, Minghua Zhang, Weiqin Jia, Yuanli Huang, Yifan Ma, Dongyang Yu, Peizhao Zhong, Zhihao Zeng, Ziyu Guo 8685 (Abstract only)	Naohiro Sato, Genya Ishigami 9260 (Abstract only)
	Configuration Design and Nonlinear Mechanical Properties Analysis of Tensegrity Robot	Design and Traction Performance Test of Bionic Paddy Wheel Based on Cattle Hoof	
	Ruiwei Liu, Xuntao Lin, Hongwei Guo, Yating Fang 9943 (Permission to publish not granted)	Lan Li, Jing Li, Baofeng Xie, Fei Lin, Long Xue 9768	
21:25 - 21:30	5-minute break		
21:30 - 22:05	Closing Ceremony		
	Chair: Liang Ding		
	Appreciations by Conference Chair: Liang Ding		
	Award Presentation: Best Paper & Best Student Paper: Péter Kiss		
	Announcement of new ISTVS Fellows: Corina Sandu		
	Introduction of 2022 ISTVS Americas Symposium, Montreal, October 5-7: Lutz Richter		
	Introduction of ISTVS 2023—16th European-African Regional Conference: Jaroslav Pytka		