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Learning Soft Robot Dynamics Using Differentiable Kalman Filters and Spatio-Temporal Embeddings 1880
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Closed Loop Control of Tendon Driven Continuum Robots Using IMUs 1888
Manu Srivastava, Richard Groff, Ian D. Walker

Machine Learning Best Practices for Soft Robot Proprioception 1894
Annan Zhang, Tsun-Hsuan Wang, Ryan L. Truby, Lillian Chin, Daniela Rus

Active Capsule System for Multiple Therapeutic Patch Delivery: Preclinical Evaluation 1902
Jihun Lee, Hoang Manh Cuong, Jayoung Kim, Eunho Choi, Hyeonwoo Kee, Seungun Yang, Jong-Oh Park, Sukho Park

Parallel Cell Array Patterning and Target Cell Lysis on an Optoelectronic Micro-Well Device 1909
Chunyuan Gan, Hongyi Xiong, Jiawei Zhao, Ao Wang, Chutian Wang, Shuzhang Liang, Jiaying Zhang, Lin Feng

Microrobot Control Method Based on Movement of Field Free Point in Gradient Magnetic Field 1915
Chutian Wang, Yiming Ji, Xinyun Luo, Chunyuan Gan, Jiapeng Yang, Jiawei Zhao, Luyao Wang, Lin Feng

Helical Propulsion in Low-Re Numbers with Near-Zero Angle of Attack 1921
Leendert-Jan W. Ligtenberg, Ilse A. A. Ekkelkamp, Frank R. Halfwerk, Constantinos Goulas, Jutta Arens, Michiel Warlé, Islam S. M. Khalil

Influence of Nanoparticle Coating on the Differential Magnetometry and Wireless Actuation of Biohybrid Microrobots 1927
Veronika Magdanz, Jack R. Cumming, Sadaf Salamzadeh, Sven Tesselaar, Lejla Alic, Leon Abelmann, Islam S. M. Khalil

Using Piezoceramic-Actuated Stages in Precision Long-Stroke Motion Systems: A Design Procedure 1933
Yazan M. Al-Rawashdeh, Mohammad Al Saaideh, Mohammad Al Janaideh

Buoyancy Enabled Non-Inertial Dynamic Walking 1939
Mark Yim, Walker Gosrich, Marc Miskin

Ultrafast Acoustic Holography with Physics-Reinforced Self-Supervised Learning for Precise Robotic Manipulation 1947
Qingyi Lu, Chengxi Zhong, Qing Liu, Teng Li, Hu Su, Song Liu

Surface Navigation of Alginate Artificial Cells in Mucus Solutions 1953
Louis William Rogowski, Justin Wood, Tobias Cooke, Gokhan Kararsiz, Min Jun Kim

Design and Control of Microscale Dual Locomotion Mode Multi-Functional Robots (μDMMFs) 1961
Aaron C. Davis, David J. Cappelleri

A New 1-Mg Fast Unimorph SMA-Based Actuator for Microrobotics 1967
Conor K. Trygstad, Xuan-Truc Nguyen, Néstor O. Pérez-Arancibia

Toward Sub-Gram Helicopters: Designing a Miniaturized Flybar for Passive Stability 1975
Kyle Johnson, Vicente Arroyos, Raul Villanueva, Adriana Schulz, Sawyer Fuller, Vikram Iyer

Manipulation of Optical Force-Induced Micro-Assemblies at the Air-Liquid Interface 1983
Nicholas Carlisle, Martin A. K. Williams, Catherine P. Whitby, Volker Nock, Jack L. Y. Chen, Ebubekir Avci

Creating a Dynamic Quadrupedal Robotic Goalkeeper with Reinforcement Learning 1989
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Walking in Narrow Spaces: Safety-Critical Locomotion Control for Quadrupedal Robots with Duality-Based Optimization 1997
Qiayuan Liao, Zhongyu Li, Akshay Thirugnanam, Jun Zeng, Koushil Sreenath

ARMP: Autoregressive Motion Planning for Quadruped Locomotion and Navigation in Complex Indoor Environments 2005
Jeonghwan Kim, Tianyu Li, Sehoon Ha

Perceptive Hexapod Legged Locomotion for Climbing Joist Environments 2012
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Design of STARQ: A Multimodal Quadrupedal Robot for Running, Climbing, and Swimming 2020
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