

Proceedings of the ASME

**INTERNATIONAL DESIGN ENGINEERING TECHNICAL
CONFERENCES & COMPUTERS AND INFORMATION IN
ENGINEERING CONFERENCE
- 2019 -**

VOLUME 5B

**43RD MECHANISMS AND ROBOTICS
CONFERENCE**

presented at

ASME 2019 INTERNATIONAL DESIGN ENGINEERING TECHNICAL CONFERENCES &
COMPUTERS AND INFORMATION IN ENGINEERING CONFERENCE

AUGUST 18-21, 2019

ANAHEIM, CALIFORNIA, USA

sponsored by

DESIGN ENGINEERING DIVISION, ASME

COMPUTERS AND INFORMATION IN ENGINEERING DIVISION, AMSE

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Two Park Avenue * New York, NY. 10016**

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Statement from By-Laws: The Society shall not be responsible for statements or opinions
Advanced in papers. . .or printed in its publications (7.1.3)

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY ASME FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

For authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, Tel: 978-750-8400

Requests for special permission or bulk reproduction should be addressed to permissions@asme.org.

ISBN NO. 978-0-7918-5924-7

© 2019 ASME

All rights reserved.

Printed in U.S.A with permission by Curran Associates, Inc. (2020)

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
Email: curran@proceedings.com
Web: www.proceedings.com

CONTENTS

43RD MECHANISMS AND ROBOTICS CONFERENCE

NOVEL MECHANISMS, ROBOTS, AND APPLICATIONS

DETC2019-97077	V05BT07A001
Topology Design and Analysis of a Novel 3-Translational Parallel Mechanism With Analytical Direct Position Solutions and Partial Motion Decoupling <i>Huiping Shen, Damien Chablat, Boxiong Zeng, Ting-li Yang</i>	
DETC2019-97088	V05BT07A002
Novel Design of a 3T2R 5-DOF Parallel Manipulator <i>Zhongxing Yang, Dan Zhang</i>	
DETC2019-97174	V05BT07A003
Wireless Power and SIMO Control Based on Magnetic Coupling Resonance Using in Delta Robot <i>Jue Wang, Genliang Chen, Hao Wang</i>	
DETC2019-97353	V05BT07A004
A Highly Manoeuvrable and Untethered Under-Actuated Legged Piezoelectric Miniature Robot <i>Hassan H. Hariri, Gim Song Soh, Shaohui Foong, Kristin L. Wood</i>	
DETC2019-97359	V05BT07A005
A New Robotic Hand for Automotive Sheet Panels <i>Dalong Gao, Ninja Huang, Lance Ransom, Richard Janis</i>	
DETC2019-97484	V05BT07A006
Eliminating Peak Impact Forces by Customizing the Passive Foot Dynamics of Legged Robots <i>Jesse J. Rond, Michael C. Cardani, Matthew I. Campbell, Jonathan W. Hurst</i>	
DETC2019-97534	V05BT07A007
Design and Simulation of a Novel High-Speed Omnidirectional Fully-Actuated Underwater Propulsion Mechanism <i>Taylor Njaka, Stefano Brizzolara, Pinhas Ben-Tzvi</i>	
DETC2019-97537	V05BT07A008
Design, Analysis, and Optimization of a New Two-DOF Articulated Multi-Link Robotic Tail <i>Yujiong Liu, Pinhas Ben-Tzvi</i>	
DETC2019-97602	V05BT07A009
A Gear-Slider Gravity Compensation Mechanism: Design and Experimental Study <i>Linh Nguyen Vu, Chin-Hsing Kuo</i>	

- DETC2019-97678**..... **V05BT07A010**
On the Kinematic Performance of a Novel 5-DOF Reconfigurable Hybrid Manipulator With Ultra Large Workspace for Automatic Perfusion of a Large-Scale Spherical Honeycomb Structure
Hui Yang, Hairong Fang, Qiaode Jeffrey Ge, Yuefa Fang
- DETC2019-97734**..... **V05BT07A011**
Design of a Totally Robotic Solution for Sampling in Pharmaceutical Industry
Mariapaola D'Imperio, Ferdinando Cannella
- DETC2019-97755**..... **V05BT07A012**
A Shape Memory Alloy Driven Crawling Robot Utilizing a Bistable Mechanism
Lingda Meng, Rongjie Kang, Dongming Gan, Guimin Chen, Jian S. Dai
- DETC2019-97854**..... **V05BT07A013**
Using Inertial Control to Improve Maneuverability of Propeller-Assisted Flapping Wing Aerial Vehicle
Alex E. Holness, Hannah Solheim, Hugh A. Bruck, S. K. Gupta
- DETC2019-97981**..... **V05BT07A014**
Improved Surgical Robot Design Using a Novel Compliant Rolling-Contact Joint
Carl A. Nelson, Cole A. Dempsey, Ethan R. Brush, M. Amine Laribi
- DETC2019-98137**..... **V05BT07A015**
Calibration of Reconfigurable Stewart-Gough Platform for Mobile Machining Application
Andreas Bennekov Hansen, Jorgen Moberg Laursen, Sebastian Theis Henriksen, Kasper Ringgaard, Morten Rydahl-Haastrup, Ole Balling
- DETC2019-98138**..... **V05BT07A016**
Feasibility Study of an Aerial Lifting Device Using Aerodynamic Drag for Ascent
Xuan Lin, Gabriel Fernandez, Sepehr Ghassemi, Dennis W. Hong
- DETC2019-98294**..... **V05BT07A017**
A Novel Variable Stiffness Compliant Robotic Gripper Based on Layer Jamming
Yuan Gao, Xiguang Huang, Ishan Singh Mann, Hai-Jun Su
- DETC2019-98361**..... **V05BT07A018**
Conceptual Design and Prototype Development of a Solar-Powered Ground Robot for Energy-Autonomous Operation
Amir Behjat, Leighton Collins, Andrew Hoffman, Sharat Chidambaran, Maulikkumar Dhameliya, Souma Chowdhury
- DETC2019-98366**..... **V05BT07A019**
Lightweight Long-Reach 5-DOF Robot Arm for Farm Application
QianWei Zhang, Reza Fotouhi, Joshua Cote, Majid Khak Pour

DETC2019-98500..... **V05BT07A020**
Development and Experimental Evaluation of a Quad-Tilt-Wing Flying Robot Platform
A. Aihaitijiang, Cagdas D. Onal

DETC2019-98513..... **V05BT07A021**
Compact Tensegrity Robots Capable of Locomotion Through Mass-Shifting
Tyler Rhodes, Vishesh Vikas

ORIGAMI-BASED ENGINEERING DESIGN

DETC2019-97094..... **V05BT07A022**
Geometric Simulation for Thick Origami
Tsz-Ho Kwok

DETC2019-97096..... **V05BT07A023**
Coupled Origami Tubes for Stiff Deployable Cantilevers
Evgueni T. Filipov, Tomohiro Tachi, Glaucio H. Paulino

DETC2019-97113..... **V05BT07A024**
Numerical Analysis of Quasi-Static Out-of-Plane Compression of Miura-Ori Patterned Sheets
Xinmei Xiang, Guoxing Lu

DETC2019-97119..... **V05BT07A025**
Simulating Compliant Crease Origami With a Bar and Hinge Model
Yi Zhu, Evgueni T. Filipov

DETC2019-97136..... **V05BT07A026**
Dynamics Analysis of the Deployment of Miura-Origami Sheets
Yutong Xia, Kon-Well Wang

DETC2019-97155..... **V05BT07A027**
Analysis of Static and Dynamic Behavior of Thick-Walled PALEO Elements
Yves Klett, Fabian Muhs, Peter Middendorf

DETC2019-97354..... **V05BT07A028**
Regular 2D and 3D Linkage-Based Origami Tessellations
Alden D. Yellowhorse, Larry L. Howell

DETC2019-97420..... **V05BT07A029**
Exploiting the Asymmetric Energy Barrier in Multi-Stable Origami to Enable Mechanical Diode Behavior in Compression
Nasim Baharisangari, Suyi Li

DETC2019-97427..... **V05BT07A030**
On the Deployment of Multistable Kresling Origami-Inspired Structures
Narayanan Kidambi, K. W. Wang

DETC2019-97435	V05BT07A031
Dynamic Transformation of an Origami String Using a Stacked-Miura Cell <i>Chang Liu, Zwe Min Htet Aung, Samuel M. Felton</i>	
DETC2019-97452	V05BT07A032
Wave Dynamics in Reconfigurable Tristable Mechanical Metamaterials <i>Hiroimi Yasuda, Lucia M. Korpas, Jordan R. Raney</i>	
DETC2019-97486	V05BT07A033
Integrated Origami-String System <i>Ke Liu, Madelyn Kosednar, Tomohiro Tachi, Glaucio H. Paulino</i>	
DETC2019-97557	V05BT07A034
Programmable Kirigami: Cutting and Folding in Science, Technology and Architecture <i>Jingyang Liu, Grace Chuang, Hun Chun Sang, Jenny E. Sabin</i>	
DETC2019-97621	V05BT07A035
Rigidly Foldable Thick Origami Using Designed-Offset Linkages <i>Robert J. Lang, Nathan Brown, Brian Ignaut, Spencer Magleby, Larry Howell</i>	
DETC2019-97715	V05BT07A036
An Origami Crease Pattern Generating Methodology for "Origami 3D Printer" <i>Yang Yang, Ichiro Hagiwara, Luis Diago, Junichi Shinoda</i>	
DETC2019-97725	V05BT07A037
Designing and Manufacturing a Super Excellent and Ultra-Cheap Energy Absorber by Origami Engineering <i>Xilu Zhao, Ichiro Hagiwara</i>	
DETC2019-97740	V05BT07A038
Characteristics of Truss Core Created by Origami Forming Method <i>Aya Abe, Kosuke Terada, Haruki Yashiro, Ichiro Hagiwara</i>	
DETC2019-97821	V05BT07A039
In-Plane Compressive Strength Analysis of Novel Folded Honeycomb Material <i>Ruijun Ma, Jianguo Cai, Yutao Wang, Jian Feng</i>	
DETC2019-97898	V05BT07A040
Graded Origami Honeycomb Tube for Energy Absorption <i>Leo de Waal, Zhong You</i>	
DETC2019-97899	V05BT07A041
Thick Folding Through Regionally-Sandwiched Compliant Sheets <i>Jared Butler, Nathan Pehrson, Spencer Magleby</i>	
DETC2019-97946	V05BT07A042
Compactly Folding Rigid Panels With Uniform Thickness Through Origami and Kirigami <i>Jingyi Yang, Zhong You</i>	

DETC2019-97983	V05BT07A043
Constructing Scissor-Like Structures and Parallelogram Linkages With 4-Crease Single-Vertex Flat-Foldable Rigid Origami and Their Thick-Panel Versions <i>David Xing, Zhong You</i>	
DETC2019-98056	V05BT07A044
Kirigami-Based Deployable Transcrease Hard Stop Models Usable in Origami Patterns <i>David W. Andrews, Alex Avila, Jared Butler, Spencer P. Magleby, Larry L. Howell</i>	
DETC2019-98072	V05BT07A045
Electromagnetic and Mechanical Analysis of an Origami Helical Antenna Encapsulated by Fabric <i>Constantinos L. Zekios, Xueli Liu, Mojtaba Moshtaghzadeh, Ehsan Izadpanahi, Hamid Reza Radnezhad, Pezhman Mardanpour, Stavros V. Georgakopoulos</i>	
DETC2019-98100	V05BT07A046
Design of a Two DOF Laminate Leg Transmission for Creating Walking Robot Platforms <i>Benjamin D. Shuch, Taha Shafa, Eric Rogers, Daniel M. Aukes</i>	
DETC2019-98107	V05BT07A047
Experimental Study on Folding Patterns and Deployability of Inflatable Structures <i>Sachiko Ishida, Hakimi Azuri</i>	
DETC2019-98121	V05BT07A048
On the Unfolding Process of Triangular Resch Patterns: A Finite Particle Method Investigation <i>Ying Yu, Yan Chen, Glaucio H. Paulino</i>	
DETC2019-98126	V05BT07A049
Characteristics of Self-Deployment in Origami-Based Systems <i>Mary E. Wilson, Spencer P. Magleby, Larry L. Howell, Anton E. Bowden</i>	
DETC2019-98168	V05BT07A050
Conceptualizing Stable States in Origami-Based Devices Using an Energy Visualization Approach <i>Alex Avila, Jacob Greenwood, Spencer P. Magleby, Larry L. Howell</i>	
DETC2019-98169	V05BT07A051
A Two-Stage Optimization Procedure for the Design of an EAP-Actuated Soft Gripper <i>Wei Zhang, Jonathan Hong, Saad Ahmed, Zoubeida Ounaies, Mary Frecker</i>	
DETC2019-98214	V05BT07A052
Kinematic Modeling of Origami-Based Forcep Designs <i>Dina Joy K. Abulon, J. Michael McCarthy</i>	
DETC2019-98368	V05BT07A053
Exploiting Origami Shape Reconfiguration in Noise Control Applications <i>Hongbin Fang, Xiang Yu, Li Cheng</i>	

SHAPE MORPHING AND RECONFIGURABLE MECHANISMS

DETC2019-97202..... **V05BT07A054**
Cylindrical Developable Mechanisms for Minimally Invasive Surgical Instruments
Kenny Seymour, Jacob Sheffield, Spencer P. Magleby, Larry L. Howell

DETC2019-97367..... **V05BT07A055**
Topology Optimization of Cable-Actuated, Shape-Changing, Tensegrity Systems for Path Generation
David H. Myszka, James J. Joo, Daniel C. Woods, Andrew P. Murray

DETC2019-97806..... **V05BT07A056**
A Novel 1-DOF Deployable Mechanism for Parabolic Cylindrical Surface Approximation
Hang Xiao, Shengnan Lu, Xilun Ding

DETC2019-98250..... **V05BT07A057**
Synthesizing Mechanical Chains for Morphing Between Spatial Curves
Yucheng Li, Andrew P. Murray, David H. Myszka

DETC2019-98292..... **V05BT07A058**
Design and Tensorial Characterization of Rectangular Harmonic Shape-Morphing Mechanism Arrays
Craig Lusk

THEORETICAL AND COMPUTATIONAL KINEMATICS (A.T. YANG SYMPOSIUM)

DETC2019-97033..... **V05BT07A059**
Topological Reconfigurations Based on a Concatenation of Bennett and RPRP Mechanisms
Kuan-Lun Hsu, Kwun-Lon Ting

DETC2019-97083..... **V05BT07A060**
Deflection Maps of Elastic Catenary Cable-Driven Robots
Leila Notash

DETC2019-97104..... **V05BT07A061**
Extended Camus Theory and Higher Order Conjugated Curves
Cody Leeheng Chan, Kwun-Lon Ting

DETC2019-97443..... **V05BT07A062**
A New Look to the Three Axes Theorem
Juan Ignacio Valderrama-Rodriguez, Jose M. Rico, J. Jesus Cervantes-Sanchez, Fernando Tomas Perez-Zamudio

DETC2019-97599..... **V05BT07A063**
A Fourier Descriptor Approach to Integrated Type and Dimensional Synthesis of Coupled Serial Mechanism for Motion Generation
Hao Lv, Yuanfei Han, Xiangyun Li, Liuxian Zhu

- DETC2019-97679**..... **V05BT07A064**
Improving the Method for Kinematic Analysis of Mechanisms That Was Based on
Parametric Polynomial System With Grobner Cover
Keisuke Arikawa
- DETC2019-97742**..... **V05BT07A065**
Mechanism Singularities Revisited From an Algebraic Viewpoint
Zijia Li, Andreas Mueller
- DETC2019-98057**..... **V05BT07A066**
Classification of a Class of 3-RER Parallel Manipulators Using Grobner Cover and
Primary Decomposition of Ideals
Xianwen Kong
- DETC2019-98136**..... **V05BT07A067**
Synthesis of Stephenson III Timed Curve Generators Using a Probabilistic
Continuation Method
Aravind Baskar, Mark Plecnik
- DETC2019-98232**..... **V05BT07A068**
Research on Minimum Pressure Angle of Bennett Linkage
Lele Bai, Lubin Hang, Xiaobo Huang, Mingyuan Wang, Ziyu Liu