

# **2022 8th International Conference on Mechanical Engineering and Automation Science (ICMEAS 2022)**

**Wuhan, China  
14 – 16 October 2022**



**IEEE Catalog Number: CFP22Z38-POD  
ISBN: 978-1-6654-6306-5**

**Copyright © 2022 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:	CFP22Z38-POD
ISBN (Print-On-Demand):	978-1-6654-6306-5
ISBN (Online):	978-1-6654-6305-8

**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

# 2022 8th International Conference on Mechanical Engineering and Automation Science (ICMEAS) **ICMEAS 2022**

## Table of Contents

Message from the General Chair .....	xiii
Message from the Program Chair .....	xiv
Conference Committee .....	xv
Reviewers .....	xvii

### Chapter 1: Design and Optimization

Design of A Variable Stiffness Actuator and Study on Its Variable Stiffness Characteristics .....	1
<i>Lan Zhang (Intelligent Robot Research Center, Zhejiang Lab, China), Guanyu Huang (Intelligent Robot Research Center, Zhejiang Lab, China), Shiqiang Zhu (Intelligent Robot Research Center, Zhejiang Lab, China), Lingyu Kong (Intelligent Robot Research Center, Zhejiang Lab, China), Anhuan Xie (Intelligent Robot Research Center, Zhejiang Lab, China), Lingkai Chen (Intelligent Robot Research Center, Zhejiang Lab, China), and Dan Zhang (York University, Canada)</i>	
An Optimal Machining Strategy Towards Efficient Sidewall Machining of Aerospace Structural Parts .....	7
<i>Zujie Zheng (Shanghai Spaceflight Precision Machinery Institute, China), Jianhua Li (Shanghai Spaceflight Precision Machinery Institute, China), Jingwen Zhou (Shanghai Spaceflight Precision Machinery Institute, China), Guoqiang Guo (Shanghai Spaceflight Precision Machinery Institute, China), Mouyu Yu (Shanghai Spaceflight Precision Machinery Institute, China), and Xing Liu (Shanghai Spaceflight Precision Machinery Institute, China)</i>	
Approach for the Formation of Geometric Parameters of Lift Surfaces of Transport Category Aircraft Based on Specific Criteria and Integral Indicators of Their Effectiveness .....	12
<i>Dmytro Tiniakov (Nanjing University of Aeronautics and Astronautics, China)</i>	
Research on the Mechanism Design of Spoiler Deflected Upward and Downward for Civil Aircraft .....	18
<i>Yunwen Feng (Northwestern Polytechnical University, China), Jiaqiang Tang (Northwestern Polytechnical University, China), Zhiyu He (Northwestern Polytechnical University, China), Xiaofeng Xue (Northwestern Polytechnical University, China), and Liang Yi (Commercial Aircraft Corporation of China Ltd, China)</i>	

Design and Evaluation of Cabin Visual Environment for Civil Aircraft .....	23
<i>Chong Wan (Shanghai Aircraft Design and Research Institute, China), Dan Weng (Shanghai Aviation Electric co.LTD., China), and Jiaji Tang (Shanghai Aircraft Design and Research Institute, China)</i>	
Design and Control of 2-DOF Ultrasonic Actuator Applied in Piezoelectric Transmission Module .....	28
<i>Shijie Tang (Foshan University, China) and Ben Ding (Foshan polytechnic, China)</i>	
Design of Simple Simulation Platform for Armed Helicopter Shooting Vibration Environment .....	33
<i>Xudong Wang (Army Aviation Institute, China), Bo Luo (Army Aviation Institute, China), and Zhiyuan Zhang (Army Aviation Institute, China)</i>	
Design and Strength Analysis of Feeding Rail Car for Long Steel Member of Tower Transportation .....	38
<i>Weiyu Chen (State Grid Fujian Electric Power CO., LTD, China), Yangsen Li (State Grid Fujian Electric Power CO., LTD, China), Chen Liu (China Electric Power Research Institute, China), Fei Wang (China Electric Power Research Institute, China), and Jian Qin (China Electric Power Research Institute, China)</i>	
Design of a Device for Automatically Coating Lubricating Coatings .....	43
<i>Jiaxi Chen (Jingchu University of Technology China, China), Changzi Chen (Jingchu University of Technology China, China), Xiao Fang (Jingchu University of Technology China, China), Haixiang Jiang (Jingchu University of Technology China, China), and QuanXin Jiang (Jingchu University of Technology China, China)</i>	
An MBSE Practice on Designing Smart and Multi-Functional Overhead Stowage Compartments ....	49
<i>Xi Lu (Shanghai Aircraft Design and Research Institute, China), Mengya Ai (Shanghai Aircraft Design and Research Institute, China), Yi Xie (Shanghai Aircraft Design and Research Institute, China), and Fan Chen (Shanghai Aircraft Design and Research Institute, China)</i>	
Design and Implementation of Visualized Marine Landscape Logo Based on ARM .....	54
<i>Jingwen Yuan (Pukyong National University, Korea), Longlong Zhang (Pukyong National University, Korea), and ChulSoo Kim (Pukyong National University, Korea)</i>	
Landscape Facade Design of Buildings Around the Ocean Based on Radial Basis Neural Network...	59
<i>Longlong Zhang (Pukyong National University, Korea), Jingwen Yuan (Pukyong National University, Korea), and Chulsoo Kim (Pukyong National University, Korea)</i>	

## Chapter 2: Dynamic System Analysis

Analysis of the Elastic Vibration Characteristics of Ship-to-air Missiles .....	64
<i>Chuan-wei Zhu (Department of Missiles and Guns, Dalian Naval Academy), Min Huang (Department of Missiles and Guns, Dalian Naval Academy), and Wen-hui Shi (Department of Missiles and Guns, Dalian Naval Academy)</i>	

Analysis of Dynamic Characteristics of Modular Drilling Rig Mast Based on Workbench .....	69
<i>Rong-quan Fan (State Grid Sichuan Electric Power Company, China), Lei Yang (State Grid Sichuan Electric Power Company, China), Jie Dong (Sichuan University, China), Yun-kai Gao (Sichuan University, China), He-yu-qiu Li (Sichuan University, China), and Qi Mei (Sichuan University, China)</i>	
Crashworthiness Analysis on Multiple Styles of Skid Landing Gear .....	76
<i>Menglong Ding (Zhejiang Lab, China), Jiandong Cai (Zhejiang Lab, China), Yanyan Zhang (Zhejiang Lab, China), Jiawei Tu (Zhejiang Lab, China), Anhuan Xie (Zhejiang Lab, China), and Dan Zhang (York University, Canada)</i>	
Comparison of Squeezing Dynamics with Contactless/Contact-Loaded High Viscous Droplets Based on a Transfer Printing .....	81
<i>Ping Zhu (Shangqiu Normal University, China), Xingyuan Wang (Harbin Engineering University, China), Zhaodi Su (Shangqiu Normal University, China), and Yuhao Li (Shangqiu Normal University, China)</i>	
Kinematic Analysis of a Novel Single-Loop Generalized Parallel Manipulator with a Compact Traveling Platform for Schöfnflies Motion .....	87
<i>Lin Wang (York University, Canada), Yuefa Fang (Beijing Jiaotong University, China), and Dan Zhang (York University, Canada)</i>	
Dynamic Characteristic Analysis of Flexible-Joint Flexible-Link Space Manipulator with Joint Friction .....	94
<i>Xiaolei Zhang (Beijing Institute of Precision Mechatronics and Controls, China), Guangwei Yu (Beijing Institute of Precision Mechatronics and Controls, China), Yanbo Wang (Beijing Institute of Precision Mechatronics and Controls, China), Shanda Wang (Beijing Institute of Precision Mechatronics and Controls, China), and Jing Zhang (Beijing Institute of Precision Mechatronics and Controls, China)</i>	
Overall Design and Resistance Analysis of Catamaran Kelp Harvester .....	99
<i>Tongshan Wang (Shandong Jiaotong University, China), Hongyuan Sun (Shandong Jiaotong University, China), Bo Gao (Shandong Jiaotong University, China), Tongfei Sheng (Weihai Renhe Electromechanical Co., LTD, China), and Haihua Lin (Shandong Jiaotong University, China)</i>	
Effect of Fly Ash Resource Reuse on Mechanical Properties of Concrete Under Dual Carbon Target .....	105
<i>Dong Dai (Shenyang University School of Architecture and Engineering, China) and Liuyan Wang (Shenyang University School of Architecture and Engineering, China)</i>	

### **Chapter 3: Manufacturing and Control Technology**

Production Capacity Improvement of Hood Production Line Based on the Theory of Constraints...	111
<i>Guanghui Yu (Beijing Benz Automobile Co., Ltd Beijing, China), Dongdong Guo (Peking University &amp; Beijing Benz Automobile Co., Ltd, China), and Shangbo Zou (Beijing Benz Automobile Co., Ltd Beijing, China)</i>	

The Fabrication of Au Nanoparticles for Photocatalysis and Medical Applications: A Review .....	117
<i>Chenghao Feng (China University of Geosciences, China)</i>	
Process Analysis and Parameter Optimization of Automobile Rear Door Outer Panel Based on Autoform .....	124
<i>Zhihang Tan (Wuhan Polytechnic University, China), Jihai Feng (Department of Design Yutong bus co., Ltd., China), Qiange Li (Wuhan Polytechnic University, China), Ming Shen (Wuhan Polytechnic University, China), Zhongyu Yuan (Energy Very Endure Co., Ltd., China), Zhouyuan Lu (Wuhan Polytechnic University, China), and Fenfang Tan (Wuhan Polytechnic University, China)</i>	
Study on Interface Control of CFRTP-TC4 Alloy Laser Joining .....	129
<i>Chenghu Jing (Yangzhou University, China), Jihao Xu (Yangzhou University, China), Shengyuan Sun (Yangzhou University, China), Junke Jiao (Yangzhou University, China), Liyuan Sheng (PKU-HKUST ShenZhen-HongKong Institution, China), and Kun Zeng (Yangzhou Hanjiang Yangzi Automobile Interior Decoration Co., Ltd, China)</i>	
Capillary Self-Bending of Micro-Manipulation Methon for Flexible Microfibers .....	133
<i>Xinyu Zeng (Shaanxi University of Science and Technology, Shanxi), Chen Li (Shaanxi University of Science and Technology, Shanxi), Bingkai Wang (Shaanxi University of Science and Technology, Shanxi), and Bo Chang (Shaanxi University of Science and Technology, Shanxi)</i>	
Motion Control of a Dexterous Manipulator Using Data Glove .....	138
<i>Xu-Chong Zhang (South China University of Technology, China), Yu-Quan Lin (South China University of Technology, China), Ying Ye (South China University of Technology, China), and Wen-Fan Li (South China University of Technology, China)</i>	
Investigation on Residual Stress of Large SiC Reinforced Aluminium Matrix Composite Forging .....	143
<i>Baosheng Liu (AVIC Manufacturing Technology Institute, China), Ran Pan (AVIC Manufacturing Technology Institute, China), Yuan Song Zeng (AVIC Manufacturing Technology Institute, China), Feng Chao Cao (AVIC Manufacturing Technology Institute, China), Ming Chen (AVIC Guizhou Anda Aviation Forging Company, China), and Xiao Bolv (Institute of Metal Research, Chinese Academy of Sciences, China)</i>	

## **Chapter 4: Measurement and Evaluation Technology**

Preliminary Study of Vibration-Based Structural Health Monitoring for Multirotor Unmanned Aerial Vehicle .....	149
<i>Jiandong Cai (Zhejiang Lab, China), Menglong Ding (Zhejiang Lab, China), Xufei Yan (Zhejiang Lab, China), Yiren Hu (Zhejiang Lab, China), Anhuan Xie (Zhejiang Lab, China), Xian Su (Beijing Sankuai Online Technology Co. Ltd., China), and Dan Zhang (York University, Canada)</i>	
Ultrasonic Measurement of Contact Stress of Tiny Interference Components .....	154
<i>Xingyuan Wang (Harbin Engineering University, China), Jiaying Liu (Harbin Engineering University, China), Zhifeng Lou (Dalian University of Technology, China), and Xiaodong Wang (Dalian University of Technology, China)</i>	

Experimental Study to Investigate the Tribological Behavior of Cylinder-Piston ring Using Acoustic Emission .....	161
<i>Jingguo Fu (Shenzhen Academy/Marine Engineering college, Dalian Maritime University, China), Dengqing Ma (Marine Engineering college, Dalian Maritime University, China), Jiang Liu (Marine Engineering college, Dalian Maritime University, China), and Xinhe Zhu (Marine Engineering college, Dalian Maritime University, China)</i>	
An Exposure Evaluation Method For Digital Radiographic Images Based On Entropy Theory .....	166
<i>Zhongyu Shang (Xi'an Jiaotong University, China), Bing Li (Xi'an Jiaotong University, China), Lei Chen (Xi'an Jiaotong University, China), and Lei Zhang (Xi'an Jiaotong University, China)</i>	
Error Analysis and Experimental Study of Twelve-Branch Orthogonal Parallel Six-Axis Force Sensor .....	171
<i>Jiehan Wang (Hebei University of Science and Technology, China), Bingyan Zhang (Hebei University of Science and Technology, China), Hao Zhang (Hebei University of Science and Technology, China), and Zhi Niu (Hebei University of Science and Technology, China)</i>	
Intralaminar Crack Detection for Carbon Fiber Reinforced Polymers Based on Laser-Line Thermography .....	178
<i>Chunman Liu (Xi'an Jiaotong University, China), Bing Li (Xi'an Jiaotong University, China), Fei Gao (Xi'an Jiaotong University, China), Lei Chen (Xi'an Jiaotong University, China), and Feng Qin (Xi'an Jiaotong University, China)</i>	
Cleaning Loss Sensors on Combine Harvesters: a Literature Review .....	185
<i>Xinyang Wu (Xidian University, China), Ji Zhang (Xidian University, China), Gang Chen (Xidian University, China), Weidong Wang (Xidian University, China), and Kyle Jiang (University of Birmingham, United Kingdom)</i>	
A Comprehensive Solution for Inspecting Cable Brackets in Aircraft Based on Augmented Reality and Deep Learning .....	192
<i>Jingyu Hu (Beihang University, China), Gang Zhao (Beihang University, China), and Wenlei Xiao (Beihang University, China)</i>	
Node Cluster Analysis of Weapon System of Systems Network Based on SLPA .....	197
<i>Changfu Dong (National University of Defense Technology, China), Xue Zheng (National University of Defense Technology, China), Shaofeng Lin (National University of Defense Technology, China), and Kebin Chen (National University of Defense Technology, China)</i>	
Performance Prediction of Exhaust Gas Turbocharger Based on One-Dimensional Convolutional Neural Network .....	202
<i>LiangSheng Hou (Shanghai Merchant Ship Design and Research Institute, China), YiFan Jiang (Shanghai Merchant Ship Design and Research Institute, China), ZhiLin Dai (Shanghai Merchant Ship Design and Research Institute, China), Li Chen (Shanghai Merchant Ship Design and Research Institute, China), Chen Cheng (Shanghai Merchant Ship Design and Research Institute, China), and Yao Qin (Shanghai Merchant Ship Design and Research Institute, China)</i>	

Chip Bifurcation Machine Learning Forecasting Model Based on Experimental Data and Random Forest Algorithm .....	207
<i>Lingfeng Zheng (Huazhong University of Science and Technology, China), Liangshan Xiong (Huazhong University of Science and Technology, China), Mingxian Xu (Huazhong University of Science and Technology, China), and Kai Yin (Huazhong University of Science and Technology, China)</i>	

## Chapter 5: Modeling and Analysis

Modeling and Simulation of the Modified Proportional Guidance law of Ship-to-air Missiles .....	214
<i>Min Huang (Department of Missiles and Guns, Dalian Naval Academy, China), Xing-bao Yang (Department of Missiles and Guns, Dalian Naval Academy, China), and Zhe-quan Fu (Department of Missiles and Guns, Dalian Naval Academy, China)</i>	
Tracking and Positioning of Industrial Objects Using CAD Models .....	219
<i>Shaohua Meng (Beijing Institute of Satellite Environmental Engineering, China), Yuan Liu (Beijing Institute of Satellite Environmental Engineering, China), Changyu Chen (Beijing Institute of Satellite Environmental Engineering, China), and Qifan Fan (Beijing Institute of Satellite Environmental Engineering, China)</i>	
3D TFSI FEA Simulation and Analysis of Thermodynamic Characteristics of a Gas-Pressurized Hydraulic Shock Absorber .....	224
<i>Wen-xue Xu (Beijing Institute of Space Launch Technology, China), Wen-jian Xie (Beijing Institute of Space Launch Technology, China), Li Zhou (Beijing Institute of Space Launch Technology, China), Wei Liu (Beijing Institute of Space Launch Technology, China), and Zhong-Feng Wang (Beijing Institute of Space Launch Technology, China)</i>	
Finite Element Analysis of Stress at Weld in Hydrogen Production Reactor Under Thermal-Mechanical-Chemical Coupling .....	230
<i>Yu Liu (Dalian University of Technology, China), ShengFang Zhang (Dalian University of Technology, China), HongTao Gu (Dalian Jiaotong University, China), ZhiBo Yu (Dalian Jiaotong University, China), Jian Yin (Dalian Jiaotong University, China), and ZhiHua Sha (Dalian Jiaotong University, China)</i>	
Research on 3D Modeling of UAV Tilt Photogrammetry .....	236
<i>Yinghui Zhang (State Grid Shandong Electric Power Construction Company, China), Zhongsheng Liu (State Grid Shandong Electric Power Construction Company, China), Yonghui Chen (State Grid Shandong Electric Power Construction Company, China), and Shengxiang Ji (State Grid Shandong Electric Power Construction Company, China)</i>	
Sensor Dynamic Modeling Based on GWO-LSSVM .....	241
<i>Qi An (Linyi University, China), Liyue Fu (Linyi University, China), and Ancai Zhang (Linyi University, China)</i>	



## Chapter 6: Aerospace Technology

Satellite-Based 6S Payload for Internet of Things .....	247
<i>Lihu Chen (National University of Defense Technology, China), Songting Li (National University of Defense Technology, China), Yong Zhao (National University of Defense Technology, China), and Sunquan Yu (National University of Defense Technology, China)</i>	
Analysis of the Specific Fuel Efficiency for Preliminary Design Stage of Transport Category Aircraft Variant .....	252
<i>Dmytro Tiniakov (Nanjing University of Aeronautics and Astronautics, China), Ludmyla Kapitanova (National Aerospace University of Ukraine, Ukraine), and Liia Makarova (Nanjing University of Aeronautics and Astronautics, China)</i>	
Design and Development of a Rapid Flight Test Data Analysis Software for Civil Aircraft .....	257
<i>Hua Yan (COMAC Flight Test Center, China)</i>	
Planning of Flight Simulator Data Package Flight Test for Civil Aircraft .....	263
<i>Zhixin Guo (COMAC Flight Test Center, China)</i>	
Flight Test Scheme Design of Flight Simulator Data Package Sound Acquisition for Civil Aircraft .....	267
<i>Zhixin Guo (COMAC Flight Test Center, China)</i>	
Computational Study of a Newly Developed wing Leading Edge Against Bird Strike .....	271
<i>Ke Zhang (School of Astronautics Northwestern Polytechnical University Xi'an, China), Muhammad Azeem Aslam (School of Astronautics Northwestern Polytechnical University Xi'an, China), and Inuwa Mamuda Bello (School of Astronautics Northwestern Polytechnical University, Xi'an, China)</i>	
Design and Development of a Debriefing Assistant System Based on Telemetry Data .....	275
<i>Hua Yan (COMAC Flight Test Center, China)</i>	
Research on Crashworthiness of a Civil Transport Aircraft .....	281
<i>Xing-Yu Wang (Nanjing University of Aeronautics and Astronautics, China), Shu-Hua Zhu (Nanjing University of Aeronautics and Astronautics, China), and Xu-Long Xi (Aircraft Strength Research Institute of China, China)</i>	
Research of Thermal Stress on a High Pressure Turbine Guide Vane During the Start-Up Period .....	287
<i>Mengyuan Tong (Nanjing University of Aeronautics and Astronautics) and Tengteng Tong (Gusu Laboratory of Materials)</i>	
2D Full Particle Simulation on the Effects of Magnetic Field Configuration of Ion Thruster .....	295
<i>Han Yan (Xi'an Jiaotong University, China)</i>	
Application of CFD Technology in Rotor Aerodynamic Simulation .....	301
<i>Chenglong Zhou (Information Science Academy of China Electronics Technology Group Corporation, China), Wei Li (Information Science Academy of China Electronics Technology Group Corporation, China), Yang Dai (Information Science Academy of China Electronics Technology Group Corporation, China), YuNong Ye (Information Science Academy of China Electronics Technology Group Corporation, China), LinTong Yan (Information Science Academy of China Electronics Technology Group Corporation, China), and Rui Yin (Information Science Academy of China Electronics Technology Group Corporation, China)</i>	

Flight Performance Prediction of a Solid Fuel Ducted Rocket Engine with Direct-Connect Ground Tests .....	308
<i>Liya Huang (National University of Defense Technology, China), Binbin Chen (National University of Defense Technology, China), Liang Meng (National University of Defense Technology, China), and He Yang (National University of Defense Technology, China)</i>	
<b>Author Index</b> .....	<b>317</b>