

Unmanned Systems

Papers Presented at the AIAA Aviation Forum 2023

San Diego, California, USA
12-16 June 2023

ISBN: 978-1-7138-7873-5

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.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 34922 Uwytkug'Xcmg{'Ftkxg.'Uwky'422, Reston, VA 20191, USA.

TABLE OF CONTENTS

AUTONOMOUS MISSION MANAGEMENT CONCEPTS & TECHNOLOGIES I

U-Space Modeling and Efficiency Evaluation in the City of Hamburg	1
<i>Majed Swaid, Alexander Lau, Florian Linke</i>	
Predictive Model for Workload in Remote Operators During sUAS Contingency Scenarios.....	17
<i>Meghan Chandarana, Megan Shyr, Terence L. Tyson</i>	
Obstacle Avoidance Algorithm for Circular Objects During Multiple Target Waypoints Navigation Mission of a Fixed-Wing UAV Using Polar Coordinates.....	26
<i>Fauzan H. Hasanbasri, Imran A. Said, Srikanth Gururajan</i>	

AUTONOMY FOR ADVANCED AIR MOBILITY SYSTEMS

Real-Time Optimal Route Planning by Deep Reinforcement Learning and Validation with Flight Test	40
<i>Junki Shim, Jinhyuk Park, Nicholas C. Song, Jaejun Jang, Jae-Young Choi, Gwonyeol Lee, Rachit Prasad, Seongim Choi</i>	
Heuristic Approach for Aircraft Assignment and Maintenance Scheduling of On-Demand Urban Air Mobility Vehicles	61
<i>Patrick Sieb, Robert Meissner, Kai Wicke, Gerko Wende</i>	
Research and Design of Precision-Landing Drone in an Underground GPS-Denied Environment	76
<i>John Racette, Chase Dunaway, Mario A. Escarcega, James Montoya, Chris Dinelli, Vasileios Androulakis, Hassan Khaniani, Sihua Shao, Pedram Roghanchi, Mostafa Hassanalian</i>	
Autonomous UAV Navigation in GPS Denied Environments Using Lidar Point Clouds.....	86
<i>Michael Briggs, Lina Castano, Eric Morgan</i>	
Non-Communicative Negotiation-Free Collision Avoidance	95
<i>Anahita Jain, John-Paul Clarke, Fanruiqi Zeng</i>	

AUTONOMOUS MISSION MANAGEMENT CONCEPTS & TECHNOLOGIES II

Formalized Reasoning of Operational Volumes for Wildland Fire Fighting	106
<i>Tanner Slagel, Maria Davis, Natasha A. Neogi</i>	
A Robotic Solution for Autonomous Battery Swapping of Unmanned Aerial Vehicles.....	121
<i>Khojasteh Z. Mirza, Ansh Bohrey, Siddarth Bangera, Henil Agrawal, Dhwanil Shukla, Rajkumar S. Pant</i>	
Partially-Observable Monocular Autonomous Navigation for UAV Through Deep Reinforcement Learning	134
<i>Yuhang Zhang, Kin Huat Low, Chen Lyu</i>	
Design and Implementation of an Attitude Determination and Control Subsystem Testbed for Up to 12-U CubeSat	146
<i>Eiman Alnaqbi, Shaikha Alghaihi, Hessa Alkaabi, Fatma Alhassani, Noura Alameri, Mohammed Atallah, Mohamed Okasha, Haitham Elshimy</i>	

SYSTEMS DESIGN AND OPTIMIZATION FOR UNMANNED/AUTONOMOUS SYSTEMS I

Withdrawn Paper	158
Test and Modeling of an Aquatic sUAS Propulsion System	159
<i>Victoria R. Lenze, Simon Miller, Julia Cole</i>	
Reactive Pilot Model Design for Automatic Mission Simulation of a Transition Vehicle.....	174
<i>Denis Surmann, Nico Sauert, Luca Hein, Stephan Myschik</i>	
Learning Constrained Corner Node Trajectories of a Tether Net System for Space Debris Capture	182
<i>Feng Liu, Achira Boonrath, Prajit KrisshnaKumar, Eleonora M. Botta, Souma Chowdhury</i>	

MACHINE INTELLIGENCE AND SW DEFINED HW & SYSTEMS DESIGN

Fuzzy Logic and Mahalanobis Distance Algorithms for Fault Detection in Fixed Wing UAVs	204
<i>Ruth Gomez Quezada, Lina Castano, Huan Xu</i>	
Robust Trajectory Planning for Multi-Rotor Aerial Vehicles Subject to Saturation Faults and Wind Disturbances	215
<i>Marcos Quinones-Grueiro, Ibrahim Ahmed, Gautam Biswas</i>	
A Rotorcraft Validation Framework Using an EKF-Based Parameter Estimation Approach.....	222
<i>Marvin Jesse, Nirmitt Prabhakar, Dominik Karbowski</i>	
Real Time Optimal Trajectory Synthesis for an Unmanned Aerial Vehicle in Urban Air Mobility Applications.....	236
<i>Bilge Kacmaz, Ranjan Vepa</i>	

SYSTEMS DESIGN AND OPTIMIZATION FOR UNMANNED/AUTONOMOUS SYSTEMS II

Unmanned Aerial Vehicles: A 21st Century Review of Advanced Air Mobility Platforms.....	253
<i>Olabode A. Olanipekun, Carlos J. Montalvo, Tajudeen A. Salau, Emmanuel O. Simolowo</i>	
Increasing the Aerodynamic Performance of a Small Flying Wing UAV Using Passive Bio-Inspired Microfibers	314
<i>Dioser Dos Santos, Ali Doosttalab, Victor Maldonado</i>	
A Framework for Developing Robust, Autonomous, Power Managed Dynamic Soaring Flight Controllers Using Deep Reinforcement Learning	323
<i>Milo F. DiPaola, Tyler F. Barkin</i>	

AUTONOMOUS TASKS/SYSTEM INTEGRATION; SYSTEMS AND CAPABILITIES FOR UNMANNED, DEEP SPACE MISSIONS II

Withdrawn Paper	345
Autonomous Flight Control for Drones Using Instrumented Gloves Technology	346
<i>Tarek N. Dief, Shouq Almazrouei, Shaima Alshamsi, Aysha Alfalahi, Mohamed Okasha, Mohamed Kamra, Farag Omar</i>	
Formation Flight of Multiple UAVs Using Artificial Potential Field Algorithm.....	368
<i>Alessandro Favia, Angelo Lerro, Piero Gili, Umberto Papa, Alberto Chiesa</i>	

Practical Implementation of Autonomous Soaring Algorithm into Open-Source Autopilot for Unmanned Aerial Vehicle.....	388
<i>Roman Langenscheidt, Jesus G. Rosales, Andreas Gross</i>	

Twistor-Based Relative Navigation of Satellite Rendezvous in Close Proximity Operations Using Unscented Kalman Filter	408
<i>Mohammed Atallah, Mohamed Okasha, Tarek N. Dief, Mohamed Kamra</i>	

GENERAL TOPICS IN AVIATION I VIRTUAL SESSION

Improvement of Cache Utilization in a Parallel CFD Code Through Mesh Reordering by Hilbert Curves.....	422
<i>George P. Silva, Jesuino T. Tomita, Cleverson Bringhamti</i>	

Discretization Error Guided Optimal Mesh Adaptation in One-Dimensional Steady Problems	430
<i>Eduardo de Oliveira Carvalho, Rodrigo Costa Moura, Andre Fernando de Castro da Silva</i>	

Momentum Thrust Enhancement of Liquid Rockets at Vacuum by Spraying High Heat Capacity Nano-Granules to the Subsonic Region of the Rocket Nozzle	446
<i>Srivatsav Sanjay Sridhar, Yash Raj, VR Sanal Kumar</i>	

AUTONOMY FOR ADVANCED AIR MOBILITY SYSTEMS & SYSTEMS DESIGN

Dynamic Modeling and Control of Cross-Shaped Quadrotor UAV Under Wind Disturbance.....	489
<i>Ningtai Zhang, Minghe Shan, Ma Jin</i>	

Improving the Safety of Unmanned Aerial Systems for Commercial Operations Through Frangibility	502
<i>Omar Abouzahr, Jamey D. Jacob</i>	

Dynamic Soaring Turbulence Rejection – A New Formulation	512
<i>Bharath Swaminathan</i>	

Author Index