

Advances in Intelligent Fault-Tolerant Systems & Applications I

Papers Presented at the AIAA SciTech Forum and Exposition
2024

Orlando, Florida, USA
8 – 12 January 2024

Volume 1 of 3

ISBN: 979-8-3313-0441-6

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

VOLUME 1

ADVANCES IN INTELLIGENT FAULT-TOLERANT SYSTEMS & APPLICATIONS I

Formation Control of Uncertain Multi-Agent Systems with Non-Identical Actuation Capacities	1
<i>Atahan Kurttisi, N. Eren Sarioglu, Kadriye Merve Dogan</i>	
Distributed Model Reference Adaptive Control for an Uncertain Modular Robotic System	15
<i>Thitiphun Vongkunghae, Islam A. Aly, Kadriye Merve Dogan</i>	
Fault-Tolerant Trajectory Prediction Using Random Forest Methodology Application to UAS-S4 Ehécatl	24
<i>Seyed Mohammad Hashemi, Ruxandra M. Botez, Georges Ghazi</i>	
Model Predictive Controller with Adaptive Neural Networks and Online State Estimation for Pitch Rate Control of the Cessna Citation X	30
<i>Rojo P. Andrianantara, Georges Ghazi, Ruxandra M. Botez</i>	
Design of a Nonlinear Adaptive Fuzzy Logic System for Cessna Citation X Speed Control	45
<i>Seyed Mohammad Hosseini, Georges Ghazi, Ruxandra M. Botez</i>	
In-Flight Testing Verification of an Adaptive Distributed Fault-Tolerant Control Architecture	59
<i>Michael Budihartono, Hever Moncayo</i>	

GN&C ARCHITECTURES FOR AUTONOMOUS SYSTEMS I

Standoff Target Tracking Using Look-Angle Shaping	79
<i>Dhiraj K. Jha, Ashwini Ratnoo</i>	
Conflict Resolution in Aerial Corridors Using a Droneage Intersection Model	89
<i>Samiksha R. Nagrare, Debasish Ghose</i>	
Data-Guided Regulator for Adaptive Nonlinear Control	102
<i>Niyousha Rahimi, Mehran Mesbahi</i>	
Passive Non-Cooperative Intruder State Estimation and Optimal-Feedback Avoidance System for UAVs	127
<i>Aniruddha S. Perumalla, Thanakorn Khamvilai, Rachel M. Axten, Eric Johnson, Anusna Chakraborty, Joseph Yadegar</i>	
Minimum Time Trajectory Optimization for a 6-DoF Quadrotor UAV Using Successive Convexification	151
<i>Hutesh Sandhu, Prateek P. Pradhan, Ketan Rajawat, Mangal Kothari</i>	
Wildland Fire Rate of Spread Estimation Using an Autonomous Unmanned Aerial System: A Case Study	169
<i>Bryce T. Ford, Joon Tai Kim, Ziyu Dong, Roger Williams, Mrinal Kumar</i>	

MULTI-AGENT CONTROL AND COORDINATION

Decentralized Reinforcement Learning for Target-Centric Formation Control in Aerospace Vehicles: A Case Study with Quadrotor Vehicles	193
<i>Aaron Craig, Liam P. McKenna, Rajnikant Sharma</i>	
Cooperative Multiple Target Encirclement Via Platooning	210
<i>Gautam Kumar, Ashwini Ratnoo</i>	
Virtual Target Selection for a Multiple-Pursuer Multiple-Evader Scenario.....	221
<i>Isaac E. Weintraub, Alexander L. Von Moll, David Casbeer, Satyanarayana G. Manyam</i>	
Robust UAV Guidance Law for Safe Target Circumnavigation with Limited Information and Autopilot Lag Considerations.....	238
<i>Praveen Kumar Ranjan, Abhinav Sinha, Yongcan Cao</i>	
Reinforcement Learning Based Decentralized Weapon-Target Assignment and Guidance	249
<i>Gleb Merkulov, Eran Iceland, Shay Michaeli, Yosef Riechkind, Oren Gal, Ariel Barel, Tal Shima</i>	
Cooperative Approximate Optimal Indirect Regulation of Uncooperative Agents with Lyapunov-Based Deep Neural Network	263
<i>Wanjiku Makumi, Zachary Bell, Jhyv Philor, Warren Dixon</i>	

ADVANCEMENT IN AAM FOR SAFE INTEGRATION IN NAS

Design of UAM Network and Ecosystem Integration	275
<i>Anjan Chakrabarty, Vaishali Hosagrahara, Andrew Lei</i>	
Fundamental Understanding of Vision in Fog/Low Visibility Conditions	290
<i>Abhishek K. Shastry, Ramona Stefanescu</i>	
Evaluating eVTOL Network Performance and Fleet Dynamics Through Simulation-Based Analysis	303
<i>Emin Burak Onat, Vishwanath Bulusu, Anjan Chakrabarty, Mark Hansen, Raja Sengupta, Banavar Sridhar</i>	
For the Birds! How Concerned Should AAM Be About Bird Strikes?	320
<i>Nicholas B. Cramer</i>	
The Use of Multi-Scale Fiducial Markers to Aid Takeoff and Landing Navigation by Rotorcraft	338
<i>Jongwon Lee, Su Yeon Choi, Timothy Bretl</i>	
The Impact of Adverse Environmental Conditions on Fiducial Marker Detection from Rotorcraft	346
<i>Su Yeon Choi, Jongwon Lee, Timothy Bretl</i>	

ADVANCES IN INTELLIGENT FAULT-TOLERANT SYSTEMS & APPLICATIONS II

Simulated Missile Operational Envelope Evaluation Following System Damage and Failures	354
<i>James M. Floyd, Mario G. Perhinschi, Wade Huebsch</i>	
Validation of Reliability-Based Flight Control Optimization for UAVs.....	367
<i>Jonathan Liscouët, Ishimwe Uwantare, Andrew Remoundos, Joshua Desrosiers, Anas Senouci, Zachary Heit, Oscar Chen</i>	

Monitoring and Control of a UAV Under Abnormal Conditions Using the Artificial Immunity Paradigm.....	381
<i>Ryan McLaughlin, Mario G. Perhinschi</i>	
Real-Time and Experimental Reactive and Proactive Defense in a Multi-Agent Scenario.....	400
<i>Jose M. Magalhaes, Lijing Zhai, Filippos Fotiadis, Aris Kanellopoulos, Kyriakos G. Vamvoudakis, Jerome Hugues</i>	
Online Aircraft System Identification Using Parameter Informed Reinforcement Learning	419
<i>Nathan Schaff, Richard J. Prazenica</i>	
Fault Tolerant Adaptive Stabilization for Multirotor Systems with Actuator Failure	441
<i>John K. Zelina, Richard J. Prazenica</i>	

GN&C ARCHITECTURES FOR AUTONOMOUS SYSTEMS II

Autonomous Parafoil System Precision Landing Via Closed-Loop Guidance and Control Considering Six-Degree-Of-Freedom Model	456
<i>Zhenyu Wei, Yan Gao, Zhijiang Shao</i>	
Complementing Human Perception in Remote Site Exploration Using Augmented Reality - A Proof of Concept	477
<i>Francesca Vergara, Andrea D. Ryals, Antonio Arenella, Lorenzo Pollini</i>	
H_{∞} Robust Control of a Quadrotor Biplane Tailsitter UAV	491
<i>Tanay Kumar, Mangal Kothari, Raktim Bhattacharya</i>	
Robust Nonlinear Control for Exact-Time Stability of a Quadrotor UAV Under Uncertainties.....	508
<i>Saurabh Kumar, Shashi Ranjan Kumar, Abhinav Sinha</i>	
A Decentralized Optimal Control Law for Multi-Circular Circumnavigation Around a Stationary Target.....	522
<i>Prateek Priyaranjan Pradhan, Arijit Sen, Mangal Kothari, Ketan Rajawat</i>	
Circumventing Unstable Zero Dynamics in Input-Output Linearization of Longitudinal Flight Dynamics.....	536
<i>Jhon M. Portella Delgado, Ankit Goel</i>	

GUIDANCE NAVIGATION AND CONTROL ARCHITECTURES FOR AUTONOMOUS SYSTEMS I

Formation Control with Finite-Time Convergence and Collision Avoidance	547
<i>Luisa D. Fairfax</i>	
Modeling and Detection of Cyber-Attacks in UAV Swarms Using a 2D-LWR Model and Gaussian Processes	556
<i>Abhishek Kashyap, Animesh Chakravarthy, Kamesh Subbarao, David Casbeer, Isaac E. Weintraub, Brandon Hincey</i>	
Learning Safe Multi-UAV Coordination with Temporal-Spatial Constraints.....	573
<i>Jean-Elie Pierre, Xiang Sun, Rafael Fierro</i>	
Distributed Formation Control of Nonholonomic Mobile Robots: A Norm-Free Adaptive Event-Triggering Approach.....	588
<i>Deniz Kurtoglu, Tansel Yucelen, Dzung Tran, David Casbeer, Eloy Garcia</i>	

INTELLIGENT SYSTEMS FOR AIR TRAFFIC MANAGEMENT

Flight Mission Feasibility Assessment of Urban Air Mobility Operations Under Battery Energy Constraint	609
<i>Abenezer G. Taye, Peng Wei</i>	
Optimization of Runway Configurations with Forecast-Augmented Offline Reinforcement Learning	624
<i>Sumanth Nethi, Milad Memarzadeh, Krishnamoorthy Kalyanam</i>	
Comprehensive Study of Machine Learning Techniques to Predict Flight Energy Consumption for Advanced Air Mobility	639
<i>Robert A. Selje, Reagan Rubio, George E. Gorospe, Liang Sun</i>	
Predicting Air Traffic Management Initiatives Using Machine Learning	650
<i>Manoj Agrawal, Tejas G. Puranik, Krishnamoorthy Kalyanam, Kelly Mulholland, Richard Tan</i>	
Air Traffic Flow Identification and Recognition in Terminal Airspace Through Machine Learning Approaches	662
<i>Wenxin Zhang, Alexia Payan, Dimitri N. Mavris</i>	

VOLUME 2

Data-Driven Trajectory-Based Consensus Approach to Traffic Management for Manned and Unmanned Aviation	671
<i>Hong-Cheol Choi, Inseok Hwang</i>	

GUIDANCE NAVIGATION AND CONTROL ARCHITECTURES FOR AUTONOMOUS SYSTEMS II

Directional Thrust Control of a Powered Wingsuit for Assisted Gliding	685
<i>Nicholas Cartocci, Roberto F. Pitzalis, Jesús Ortiz, Jesse Jaramillo, Tansel Yucelen, Mario L. Fravolini</i>	
A Hybrid Model Reference Adaptive Control System for Multi-Rotor Unmanned Aerial Vehicles	700
<i>Mattia Gramuglia, Giri Mugundan Kumar, Andrea L'Afflitto</i>	
Gain-Scheduled Model Reference Adaptive Control for a Guided Projectile	721
<i>Benjamin C. Gruenwald, Joshua Bryson</i>	
Development of a Model Reference Adaptive Control Architecture in a Hexarotor Simulation Environment	732
<i>Jesse Jaramillo, Kevin Wilcher, Tansel Yucelen, Mehrdad Pakmehr</i>	
Rapid Generation of Backup Trajectories for Run-Time Assurance of Vehicles and Other Dynamical Systems	752
<i>Ibrahim A. Alomar, Abdulaziz Alfaadehl, Eric Feron, Hesham Shageer</i>	

SYSTEMS HEALTH MANAGEMENT

Advancing Fault Diagnosis in Aircraft Landing Gear: An Innovative Two-Tier Machine Learning Approach with Intelligent Sensor Data Management.....	763
<i>Kadripathi KN, Dmitry Ignatyev, Antonios Tsourdos, Adolfo Perrusquia</i>	
Unreal Success: Vision-Based UAV Fault Detection and Diagnosis Framework.....	777
<i>José Ignacio de Alvear Cárdenas , Coen C. de Visser</i>	
Functional Monitor Models and Detection Methods for Sensor Data Variance of a Real-Time Cyber-Physical System.....	801
<i>Matthew W. Gelber, Alex Wyatt, Ammar Al Habbal, Robert H. Klenke</i>	
Explainable Machine Learning for Turbojet Engine Prognostic Health Management	816
<i>Prajwal Balasubramani, Qian Shi, Daniel DeLaurentis</i>	

AUTONOMY

Adaptive Cruise Control for Small UAS Leader-Follower Formation Flight	827
<i>Michael Variny, Travis W. Moleski, Jay Wilhelm</i>	
Quadrotor Takeoff Trajectory Planning in a One-Dimensional Uncertain Wind-Field Aided by Wind-Sensing Infrastructure.....	838
<i>Nicholas P. Kakavitsas, Artur Wolek</i>	
Rendezvous Cones to Achieve Docking with Spinning Objects in Space.....	856
<i>Animesh Chakravarthy, Debasish Ghose</i>	
Enabling Inter-Vehicle Coordination Through Observable Control Policies.....	867
<i>Andres Enriquez Fernandez, John J. Bird</i>	

INTELLIGENT SYSTEMS IN GUIDANCE NAVIGATION AND CONTROL

Evolutionary Reinforcement Learning: A Hybrid Approach for Safety-Informed Intelligent Fault-Tolerant Flight Control	880
<i>Vlad Gavra, Erik-Jan Van Kampen</i>	
Visual Pursuit Guidance Strategy with Shrinking Horizon Replanning for Drones	903
<i>Ahmet T. Cetin, Emre Koyuncu</i>	
Pure Pursuit of a Target on a Circular Trajectory	912
<i>Alexander L. Von Moll, David Casbeer, Isaac E. Weintraub, Meir Pachter</i>	
On Deep Reinforcement Learning for Target Capture Autonomous Guidance	925
<i>Umer Siddique, Abhinav Sinha, Yongcan Cao</i>	
A Reinforcement Learning-Based Continuation Strategy for Autonomous On-Orbit Assembly	940
<i>Siavash Tavana, Sepideh Faghihi, Anton de Ruiter, Krishna D. Kumar</i>	

TRUSTED SPACE AUTONOMY I

Using Enhanced Simulation Environments to Accelerate Reinforcement Learning for Long-Duration Satellite Autonomy	958
<i>Mark Stephenson, Lorenzo Mantovani, Sean Phillips, Hanspeter Schaub</i>	
Fault Tolerant Run Time Assurance with Control Barrier Functions for Rigid Body Spacecraft Rotation	973
<i>David van Wijk, Manoranjan Majji, Kerianne L. Hobbs</i>	
State Omniscience for Cooperative Local Catalog Maintenance of Close Proximity Satellite Systems.....	992
<i>Chris W. Hays, Kristina Miller, Alexander A. Soderlund, Sean Phillips, Troy Henderson</i>	
Deep-Learning Based Multiple-Model Bayesian Architecture for Spacecraft Fault Estimation.....	1009
<i>Rocio Jado, Hever Moncayo</i>	

GUIDANCE NAVIGATION AND CONTROL ARCHITECTURES FOR AUTONOMOUS SYSTEMS III

Machine Learning Approach to Estimation of Human-Pilot Model Parameters	1027
<i>Stephen Brutch, Hever Moncayo</i>	
Machine Learning Across Different Levels of Auction Based Coordination Hierarchies	1039
<i>Hannah Lehman, John Valasek</i>	
Robotic Spacecraft Testbed for Validation and Verification of AI-Attitude Controllers.....	1051
<i>Sebastian Leon-Serna, Tatiana A. Gutierrez, Hever Moncayo</i>	
Applied Optimal Estimation for Passive Acoustic-Based Range Sensing and Surface Detection	1071
<i>Rachel J. Sutor, Alisha Sharma, Jason Geder, Marius Pruessner, Theodore Martin, Donald Sofge</i>	
Coverage Path Planning of a Drone-Tethered Boat for Bathymetry Mapping from Remote Sensing Imagery.....	1087
<i>Andres Pulido, Blake Sanders, Nicholas Sardinia, Antonio Diaz, Henry Tingle, Peter Ifju, Jane Shin</i>	

TRUSTED SPACE AUTONOMY II

Using Surprise Index for Competency Assessment in Autonomous Decision-Making.....	1097
<i>Akash Ratheesh, Ofer Dagan, Nisar R. Ahmed, Jay W. McMahon</i>	
Emulation of Close-Proximity Spacecraft Dynamics in Terrestrial Environments Using Unmanned Aerial Vehicles.....	1108
<i>Sean Phillips, Zachary Lippay, Dan Baker, Alexander A. Soderlund, Matt Shubert</i>	
Dynamic Assurance of Autonomous Systems Through Ground Control Software	1127
<i>Irfan Sljivo, Ivan Perez, Anastasia Mavridou, Johann Schumann, Pavlo G. Vlastos, Corey Carter</i>	
Applications of Machine Learning to Launch Vehicles.....	1140
<i>Vinay K. Goyal, Elizabeth Davison, Nikolas Nordendale, Chad Foerster, Sahar Maghsoudy-Louyeh, Akhil Gujral, Jeerapong Wongchote</i>	

DISTRIBUTING SENSING AS ENABLING TECHNOLOGY FOR AUTONOMOUS AIR MOBILITY I

Visual & Inertial Datasets for an eVTOL Aircraft Approach and Landing Scenario.....1158
Nelson Brown, Evan Kawamura, Luke Bard, A.J. Jaffe, Wayne Ringelberg, Keerthana Kannan, Corey A. Ippolito

Flight Test Design and Implementation for Independent Surveillance of an Airspace Through a Distributed Ground Sensing Network1169
Vahram Stepanyan, Corey A. Ippolito, Keerthana Kannan, Evan Kawamura, Thomas Lombaerts, Wendy Holforty, Chester Dolph

Hierarchical Mixture of Experts for Advanced Air Mobility Flight Phase Classification1183
Evan Kawamura, Thomas Lombaerts, Vahram Stepanyan, Keerthana Kannan, Chester Dolph, Corey A. Ippolito

Development and Field Test Results of Distributed Ground-Based Sensor Fusion Object Tracking 1206
Thomas Lombaerts, Evan Kawamura, Keerthana Kannan, Chester Dolph, Vahram Stepanyan, George E. Gorospe, Corey A. Ippolito

GUIDANCE NAVIGATION AND CONTROL ARCHITECTURES FOR AUTONOMOUS SYSTEMS IV

Command Differential Learning Rate in Model Reference Adaptive Control for Improved System Performance..... 1240
Jesse Jaramillo, Tansel Yucelen

Performance Comparison of Adaptive Autopilot Architectures for Multicopter Stabilization and Trajectory Tracking 1249
Yin Yong Chee, Parham Oveissi, Juan Paredes, Dennis S. Bernstein, Ankit Goel

Optimal Tracking Control Based on Command Governor for Uncertain System 1261
Meryem Deniz, Tansel Yucelen, Jesse Jaramillo

DISTRIBUTING SENSING AS ENABLING TECHNOLOGY FOR AUTONOMOUS AIR MOBILITY II

Optimal Sensor Mobility Design for Target Tracking with Distributed Sensing, Communication and Computing Infrastructure 1270
Vahram Stepanyan, Corey A. Ippolito, Evan Kawamura, Thomas Lombaerts

Adaptive Sensor Registration Across Distributed Airspace Surveillance Networks 1283
Corey A. Ippolito, Thomas Lombaerts

Developing RF Ranging-Based Multi-Rotor Test-Bed for Cooperative Localization..... 1296
Jayanth Ammapalli, Rohith Boyinine, Ross Thayer, Rajnikant Sharma, Anusna Chakraborty

Distributed Sensor Fusion of Ground and Air Nodes Using Vision and Radar Modalities for Tracking Multirotor Small Uncrewed Air Systems and Birds 1321
Chester Dolph, Thomas Lombaerts, Corey A. Ippolito, Vahram Stepanyan, Evan Kawamura, Keerthana Kannan, George Szatkowski, Todd Ferante, Christopher Morris, Federica Vitiello, Flavia Causa, Roberto Opromolla, Giancarmine Fasano

VOLUME 3

GUIDANCE NAVIGATION AND CONTROL ARCHITECTURES FOR AUTONOMOUS SYSTEMS V

Multi-Objective Optimal Control of High Aspect Ratio Wing Wind Tunnel Model.....	1337
<i>Christopher J. Forte, Nhan T. Nguyen</i>	
Experimental Study on Active Vibration Control of a Piezo-Beam Structure with Finite Series Based Adaptive Controller	1357
<i>Rustu B. Gezer, A. Burkay Alan, Ali T. Kutay, Melin Sahin</i>	
Nonlinear Distributed Hamiltonian Control of Very Flexible Aircraft with Adaptive Gust Rejection	1371
<i>Nhan T. Nguyen, Ilhan Tuzcu</i>	
Using Polarimetric Data from Space-Based Observers to Characterize High Altitude Airborne Objects.....	1392
<i>Andrew T. Swenson, Christopher Nebelecky, John L. Crassidis</i>	
Increasing Autonomy of Aerospace Systems Via PINN-Based Solutions of HJB Equation	1406
<i>Roberto Furfaro, Andrea D'Ambrosio</i>	

DISTRIBUTING SENSING AS ENABLING TECHNOLOGY FOR AUTONOMOUS AIR MOBILITY III

Flight Test Configuration of the Sensor Payload and the Ground Nodes in Distributed Sensing Frameworks	1419
<i>Keerthana Kannan, Corey A. Ippolito, Wendy Holforty</i>	
Experimental Testing of Data Fusion in a Distributed Ground-Based Sensing Network for Advanced Air Mobility.....	1443
<i>Federica Vitiello, Flavia Causa, Roberto Opromolla, Giancarmine Fasano, Chester Dolph, Todd Ferante, Thomas Lombaerts, Corey A. Ippolito</i>	
Anytime Perception and Control for Safe and Intelligent Urban Air Mobility.....	1459
<i>Heechul Yun, Ahmet Soyyigit, Qitao Weng, Shawn S. Keshmiri, Pavithra Prabhakar, Nelson Brown</i>	
Ground-Based Vision Tracker for Advanced Air Mobility and Urban Air Mobility	1470
<i>Evan Kawamura, Keerthana Kannan, Thomas Lombaerts, Vahram Stepanyan, Chester Dolph, Corey A. Ippolito</i>	
Identifying Similar Thunderstorm Sequences for Airline Decision Support Via Optimal Transport Theory	1492
<i>Binshuai Wang, James Pinto, Peng Wei</i>	

ADAPTIVE & INTELLIGENT CONTROL I

Predictive Cost Adaptive Control of a Planar Missile with Unmodeled Aerodynamics.....	1507
<i>Alireza Farahmandi, Brian Reitz</i>	
Model Reference Adaptive Control and Reference Governor: Numerical Results on Parrot Bebop 2	1519
<i>Martín Pascual Albericio, Ivan G. Gonzalez Tamarit, Guido Magnani, Willian Jussiau</i>	

Surrogate Modeling of the Aerodynamic Performance for Airfoils in Transonic Regime	1536
<i>Mohamed Elrefaie, Tarek Ayman, Mayar Elrefaie, Eman Sayed, Mahmoud Ayyad, Mohamed M. AbdelRahman</i>	

ADAPTIVE & INTELLIGENT CONTROL II

Flight Testing Reinforcement Learning Based Online Adaptive Flight Control Laws on CS-25 Class Aircraft.....	1550
<i>Ramesh B. Konatala, Erik-Jan Van Kampen, Gertjan Looye, Daniel Milz, Christian Weiser</i>	
Fly-By-Feel: Learning Aerodynamics from Multimodal Wing Mechanics.....	1571
<i>Tanay Topac, Cody Gray, Fu-Kuo Chang</i>	
Evaluating a DNN Trained on a Laboratory-Generated Dataset Against Actual Flight Test Data for Completing the Autonomous Aerial Refueling Mission.....	1592
<i>Dillon Miller, Violet Mwaffo, Donald H. Costello</i>	
Environment Adversarial Reinforcement Learning.....	1601
<i>John R. Cooper</i>	

FAULT TOLERANT CONTROL

Hybrid Soft Actor-Critic and Incremental Dual Heuristic Programming Reinforcement Learning for Fault-Tolerant Flight Control.....	1608
<i>Casper Teirlinck, Erik-Jan Van Kampen</i>	
Using Reinforcement Learning for AI Systems in the Mitigation of Automation Failures and Stall Recovery in Complex Aircraft.....	1630
<i>Cynthia Koopman, David Zammit-Mangion</i>	
Optimal Stall Recovery Via Deep Reinforcement Learning for a General Aviation Aircraft.....	1641
<i>Agustin Grillo, Gabriel Torre, Roberto Bunge</i>	
Design, Formalization, and Verification of Decision Making for Intelligent Systems	1654
<i>Mohammad Hejase, Andreas Katis, Anastasia Mavridou</i>	

HUMAN - AUTOMATION INTERACTION

Demonstration of a Prototype Flight Software Suite for Autonomous Planning.....	1667
<i>Timothy D. Woodbury, Patrick McNamara</i>	
Intelligent Decision Support for Target Tracking Analysis and Characterization.....	1688
<i>Hunter M. Ray, Nicholas Conlon, Nisar R. Ahmed, Eli Kravitz, Ian Thomas, Danielle Szafir, Trevor Wilson, Lynn Montgomery, Samuel Elting</i>	
Probabilistic Learning of Operator Interest in Surveillance Environments for Online Track Characterization.....	1704
<i>Eli Kravitz, Hunter M. Ray, Nicholas Conlon, Nisar R. Ahmed, Ian Thomas, Danielle Szafir</i>	
Safety, Trust, and Ethics Considerations for Human-AI Teaming in Aerospace Control	1722
<i>Kerianne L. Hobbs, Bernard Li</i>	
Autoencoder-Based Pilot Error Quantification Model for Aviation Safety	1740
<i>Prashant C. Mural, Rathna GN, Virat Bhola</i>	

Classification of Notices to Airmen Using Natural Language Processing	1753
<i>Aiden Szeto, Aditya N. Das</i>	

TRAJECTORY AND PATH PLANNING I

A Leader-Follower Control Strategy Built and Refined Using Relational Maneuver Primitives for Approximating Optimal Trajectories in Real-Time	1763
<i>Carl Gotwald, Michael D. Zollars, Jonah A. Reeger, Isaac E. Weintraub</i>	
A Deployable, Decentralized Hierarchical Reinforcement Learning Strategy for Trajectory Planning and Control of UAV Swarms.....	1782
<i>Grant Phillips, Justin M. Bradley, Chandima Fernando</i>	
Generalized Multiagent Reinforcement Learning for Coverage Path Planning in Unknown, Dynamic, and Hazardous Environments	1796
<i>Andrea Henshall, Sertac Karaman</i>	
Simultaneous Planar Path Planning and Vector Field Generation Via Interpolating Implicit Functions	1806
<i>Adam R. Gerlach</i>	
Rough Terrain Path Planning for Autonomous Ground Robot	1818
<i>Xuan-Phat Truong, Seong Hyeon Hong</i>	

VISION AIDED AUTONOMY

Image Processing-Based Real-Time Safe Site Identification for Autonomous Landing	1832
<i>Jimin Choi, Jaemyung Ahn</i>	
Taking a PEEK into YOLOv5 for Satellite Component Recognition Via Entropy-Based Visual Explanations	1843
<i>Mackenzie Meni, Trupti Mahendrakar, Olivia D. Raney, Ryan T. White, Michael L. Mayo, Kevin R. Pilkiewicz</i>	
Image Segmentation Using Deep Neural Network for the Autonomous Aerial Refueling Mission.....	1859
<i>Violet Mwaffo, Donald H. Costello, Dillon Miller</i>	
Rapid Abstraction of Spacecraft 3D Structure from Single 2D Image	1869
<i>Tae Ha Park, Simone D'Amico</i>	
FALCO: Flight and AI-Enabled Coordination and Object-Detection for Search and Rescue Missions	1891
<i>Abdoulaye Diallo, Hunter M. Ray, Nisar R. Ahmed</i>	

TRAJECTORY AND PATH PLANNING II

UAS Data Retrieval for Large Sensor Networks.....	1909
<i>Nathan Kimmel, Jack W. Langelaan</i>	
Multi-Agent Search and Rescue Applied to a Swarm of Ground Vehicles.....	1933
<i>John R. Cooper, Matthew P. Vaughan, Benjamin N. Kelley</i>	
Task Planning Strategies for a Remote Sensing Water Quality Mission	1942
<i>Christina Erwin, Ben Gorr, Daniel Selva</i>	

The Troupe System: An Autonomous Multi-Agent Rover Swarm	1958
<i>Nathaniel Benz, Irfan Slijivo, Pavlo G. Vlastos, Aaron Woodard, Corey Carter, Mohammad Hejase</i>	
Learning-Accelerated A* Search for Risk-Aware Path Planning	1974
<i>Jun Xiang, Junfei Xie, Jun Chen</i>	
Simulations of Hierarchical Belief Sharing for Multi-Agent Coverage with Heterogeneous Targets	1986
<i>Andrew Meighan, Jonathan Ponniah, Or D. Dantsker</i>	

Author Index