# 2nd IFAC Workshop on Aerospace Control Education

July 22-24, 2024 Bertinoro, Italy

INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL

## Monday, 22 July 2024

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| **12:00 - 15:00** | **Arrival and Check-in** |
| **15:00 - 15:30** | **Welcome** |
| **15:30 - 17:30** | **Session 1 - Tools, Testbeds, and Laboratories for Aerospace Control Education**<br>**Chair: Dario Modenini; Co-chair: Fabrizio Stesina** |
| **15:30**<br>ID - 10 | The EXTREMA Thruster-In-The-Loop Experiment: a Facility for Hands-on Testing of Spacecraft Guidance Algorithms<br>*Alessandro Morselli*, Francesco Topputo* |
| **15:50**<br>ID - 28 | A 2DoF Twin Rotor MIMO System for Teaching and Research<br>*Kelechi Uchechukwu Ebirim*, Nadjim Mehdi Horri, Emmanuel Prempain* |
| **16:10**<br>ID - 29 | Two Testbeds for Aerospace GNC Education<br>*Andreas Steinleitner*, Benjamin Rothaupt, Walter Fichter* |
| **16:30**<br>ID - 37 | Supporting Flight Dynamics, Parameter Identification and Simulation Teaching with a Flying Classroom<br>*James F. Whidborne*, Simon Place, Mushfiqul Alam, Linghai* |
| **16:50**<br>ID - 45 | Sensor Cube - A Tool for Hands-on Learning of Sensor Data Processing<br>*Michael Bleier** |
| **17:10**<br>ID - 48 | CubeSat Ground Test Facility as a Tool for Collaborative Hands-On Education: The Joint Experience of the u3s and STAR Laboratories.<br>*Andrea Curatolo*, Dario Modenini, Fabrizio Stesina, Alessandro Campisi, Marco Grisolia, Luca Niero* |
| **17:30 - 18:00** | **Tribute to Evelin Gottzein**<br>***Prof. Klaus Schilling - University of Wurzburg*** |
| **18:15** | **Welcome Cocktail** |

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## Tuesday, 23 July 2024

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|---|---|
| **8:30 - 10:30** | **Session 2 - AI and Digital Technologies for Aerospace Control Education**<br>**Chair: Fabrizio Stesina; Co-chair: Alessandro Morselli** |
| **08:30**<br>ID - 1 | Experiences and Insights from a Mini-Course on Responsible Generative AI Use in Aerospace Engineering<br>*Rafael Vazquez** |
| **08:50**<br>ID - 15 | Intelligent Control for Aerospace Engineers: A Novel Educational Framework<br>*Mohammad Narimani, Seyyed Ali Emami*, Paolo Castaldi* |
| **09:10**<br>ID - 17 | Automatic Generation of Examinations in the Automatic Control Courses: Decision Support Matlab/LateX Toolkit for Stepwise Constructive Alignment<br>*Alexander A. Stotsky*, Torsten Wik* |
| **09:30**<br>ID - 20 | Exploration and Reflections on Empowering Aerospace Control Education through Digitalization<br>*Tao Meng*, Renhao Mao, Shujian Sun* |
| **09:50**<br>ID - 24 | Integrating Digital Twin Technologies into the Group Design Project for the Advanced Air Mobility Systems MSc Course<br>*Junjie Zhao*, Ruechuda Kallaka, Christopher Conrad, Tingyu Gong, Yan Xu, Antonios Tsourdos* |
| **10:10**<br>ID - 47 | Artificial Intelligence-Based Challenges as an Educational Tool in Aerospace Engineering: the u3s Laboratory Experience<br>*Alessandro Lotti*, Dario Modenini* |
| **10:30 - 11:00** | **Coffee Break** |
| **11:00 - 13:00** | **Session 3 - Emerging Technologies and Tools for Teaching Aerospace Control Systems**<br>**Chair: Alessandro Morselli; Co-chair: Alessandro Lotti** |
| **11:00**<br>ID - 14 | From Aerospace Education to Renewables: Designing a Controllable Wind Turbine<br>*Daniel Ossmann** |
| **11:20**<br>ID - 18 | High-Fidelity Orbital Simulator for Testing Guidance and Control Strategies in Target Inspection Maneuvers<br>*Jean-Luc Sarvadon, Leonardo Lucetti, Dario Ruggiero*, Mauro Mancini, Elisa Capello* |
| **11:40**<br>ID - 30 | Engaging Students in Control Engineering through Sloshing Experiments<br>*Michael Fogel, Laurent Burlion** |
| **12:00**<br>ID - 38 | In the Loop Simulation to Support the Cubesat Projects in any Phase of the Product Lifecycle<br>*Fabrizio Stesina*, Sabrina Corpino* |
| **12:20**<br>ID - 33 | Kalman Filter as Observer and Smoother for Rigid-Body Motion Control Applications<br>*Joel Reis, Carlos Silvestre** |
| **12:40**<br>ID - 46 | A Virtual Quadrotor Simulation Platform for Control Education<br>*Zhenhua Wang*, Zhao RuiHong, Yi Shen* |
| **13.00 - 14.15** | **Lunch Break** |
| **14:15 - 15:15** | **Plenary Lecture - Innovative Approaches to Aerospace Control Systems Education: Designing and Implementing a Master-Level Track at Politecnico di Milano**<br>***Prof. Marco Lovera, Politecnico di Milano*** |
| **15:15 - 16:35** | **Session 4 - Drones for Aerospace and Control Education I**<br>**Chair: Laurent Burlion; Co-chair: Davide Invernizzi** |
| **15:15**<br>ID - 11 | Project-Based Learning for Multi-Agent Autonomy Using Quadrotors<br>*Hae-In Lee*, Dmitry Ignatyev, Hyo-Sang Shin, Antonios Tsourdos* |
| **15:35**<br>ID - 21 | Bachelor's Final Projects: Integrating Multidisciplinary Learning via Multi-rotor Testbench Design<br>*Massimiliano Bertoni*, Riccardo Antonello, Giulia Michieletto* |
| **15:55**<br>ID - 23 | Teaching Pursuit Evasion Differential Games Through the Use of Robotic Platforms<br>*Stephane Le Menec*, Rachel Ababou, Jean Motsch* |
| **16:15**<br>ID - 32 | Experiential Learning in Automatic Control Using Quadrotor UAVs<br>*Simone Panza, Yejin Wi*, Davide Invernizzi, Marzia Cescon, Marco Lovera* |
| **16:35 - 17:05** | **Coffee Break** |
| **17:05 - 18:25** | **Session 5 - Drones for Aerospace and Control Education II**<br>**Chair: Davide Invernizzi; Co-chair: Laurent Burlion** |
| **17:05**<br>ID - 35 | Playing Rock-Paper-Scissors with a Drone: a Game-Development Approach to Promote AI and Robotics to Students in Engineering<br>*Chiraz Trabelsi*, Steeve Franklin Yagapin, Sylvain Bertrand, Lionel Prevost* |
| **17:25**<br>ID - 41 | Feedback on Drone Arenas-based Remote International Teaching - DAReTeach<br>*Cristina Stoica*, Sylvain Bertrand, Laurent Burlion* |
| **17:45**<br>ID - 42 | Return: Group Design Project for Pin-Point Landing Demonstrator using Drone Technologies<br>*Leonard Felicetti*, Dmitry Ignatyev, Grustan Enric, Antonios Tsourdos* |
| **18:05**<br>ID - 43 | Control-oriented Modeling and Hierarchical Control of Multirotor UAVs for Research and Teaching Purposes<br>*Marta Manzoni, Roberto Rubinacci, Giovanni Gozzini, Davide Invernizzi** |
| **20:15** | **Social Dinner** |

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## Wednesday, 24 July 2024

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|---|---|
| **8:30 - 10:30** | **Session 6 - Project-Based Learning in Aerospace Control Education**<br>**Chair: Alessandro Lotti; Co-chair: Dario Modenini** |
| **08:30**<br>ID - 6 | CDIO-Based Outstanding Engineers Training Model in Aerospace<br>*Chengfei Yue, Ming Liu, Fan Wu, Xueqin Chen*, Shi Qiu, Jie Mei, Guangfu Ma, Xibin Cao* |
| **08:50**<br>ID - 7 | Exploration of Aerospace Talents Training Mode: Innovation Workshop<br>*Xueqin Chen, Fan Wu, Shi Qiu, Jinsheng Guo, Chengfei Yue*, Ming Liu, Xibin Cao* |
| **09:10**<br>ID - 27 | Concurrent Engineering to Enhance Autonomy for Deep-Space CubeSat Mission Design<br>*Serena Campioli*, Fabrizio Stesina, Emanuela La Bella, Sabrina Corpino, Luca Niero, Chiara My* |
| **09:30**<br>ID - 12 | Hands-On Education for Smart, Small, Self-Organizing Satellite Systems in “New Space”<br>*Klaus Schilling** |
| **09:50**<br>ID - 19 | Improved Attitude Stabilisation System Augmented Sounding Rocket Design, Integration, Verification & Launch<br>*Alexandra Posta, Alexandre Monk, Antoine Durollet, Oliver Martin, Sam Bruton, Jongrae Kim** |
| **10:10**<br>ID - 26 | A Modular Avionics Architecture for a Planetary Rover Demonstrator for Human Assistance<br>*Nicola di Gruttola Giardino*, Federico Fantastico, Leonardo Maria Festa, Giacomo Gorgerino, Federico Mustich, Fabrizio Stesina, Edoardo Vacchetto* |
| **10:30 - 11:00** | **Coffee Break** |
| **11:00 - 13:00** | **Session 7 - Teaching and Learning Theory and Experiences in Aerospace Control Education I**<br>**Chair: Francesco Sanfedino; Co-chair: Hyo-Sang Shin** |
| **11:00**<br>ID - 3 | Aerospace Automatic Control Educational Programs: Industrial Framework Contribution<br>*Houria Siguerdidjane*, Helene Piet-Lahanier, Sihem Tebbani* |
| **11:20**<br>ID - 4 | European Satellite Benchmark for Control Education and Industrial Training<br>*Francesco Sanfedino*, Paolo Iannelli, Daniel Alazard, Émilie Pelletier, Samir Bennani, Benedicte Girouart* |
| **11:40**<br>ID - 5 | The Structured Hinfini Technique in Aerospace Engineering Education: Application to Orbital Station-keeping<br>*David Henry** |
| **12:00**<br>ID - 16 | A Unified Framework To Design Time-Constrained Control Systems and its Application to Attitude Control of a Rigid Spacecraft<br>*Mostafa Ezabadi, Seyyed Ali Emami*, Paolo Castaldi* |
| **12:20**<br>ID - 39 | Representing the Dynamics of Student Learning and Interactions with a University Curriculum<br>*Paolo Castaldi*, Nicola Mimmo* |
| **12:40**<br>ID - 44 | Delivery Race Game: a Stimulative Approach to Engage Students in Robotics and Control<br>*Alexis Hanne, Come Hosxe, Quentin Reynes, Theo Schneider, Cristina Stoica*, Aarsh Thakker, Sylvain Bertrand* |
| **13.00 - 14.15** | **Lunch Break** |
| **14:15 - 15:55** | **Session 8 - Teaching and Learning Theory and Experiences in Aerospace Control Education II**<br>**Co-chair: Hyo-Sang Shin; Co-chair: Alessandro Lotti** |
| **14:15**<br>ID - 9 | A Bachelor's DegreeCcourse on Principle of Flight Simulation<br>*Calogero Orlando*, Antonio Esposito* |
| **14:35**<br>ID - 25 | Developing a Stackable Programme Based on the Advanced Air Mobility Systems MSc Course<br>*Junjie Zhao*, Tingyu Gong, Christantus Obinna Nnamani, Christopher Conrad, Rodolphe Fremond, Yiwen Tang, Yan Xu, Antonios Tsourdos* |
| **14:55**<br>ID - 31 | Adaptive Model Predictive Control with Online Parameter Learning during Spacecraft Proximity Operations<br>*Antonio D'Ortona*, Lucrezia Lovaglio, Fabrizio Stesina* |
| **15:15**<br>ID - 40 | Hands-On Flight Dynamics and Controls Teaching using Flight Simulators<br>*Felix Biertümpfel*, Christophe Annon, Harald Pfifer* |
| **15:35**<br>ID - 13 | Space Engineering Education Based on Real Satellite Projects - Importance of Experiencing Failures, Problem Solving and Iterations<br>*Shinichi Nakasuka** |
| **15:55 - 16:25** | **Closing Ceremony** |
| **16:30 - 18:00** | **Meeting IFAC TC 7.3** |