

Motivation, tutorial scope, structure, and speakers

Daniel Bonilla Licea¹, Giuseppe Silano^{3,2}, Hajar El Hammouti¹, Martin Saska², and Mounir Ghogho¹

Half-day Tutorial Session at ICUAS 2026 (09:00 – 13:00), 15th June 2026
Room Calypso A – Divani Corfu Palace

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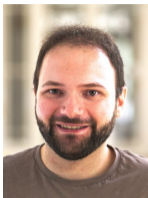
Organizers



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Wireless communications, UAV networks



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Robotics, control, UAV communications



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Security, wireless networks, UAVs



PROF. MOUNIR GHOGHO

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Signal processing, wireless communications



PROF. MARTIN SASKA

CTU-P, Czechia

Multi-robot systems, UAV swarms

Motivation, Objectives, and Key Points

Motivation

- Communication performance depends on dynamics, actuation, and platform geometry.
- **u-MRAVs** couple **motion and attitude**, limiting orientation-sensitive communication tasks.
- Emerging aerial networks require communication-aware and dynamically feasible platforms.

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Objectives

- Present a control-oriented view of communications-aware aerial systems.
- Compare **u-MRAVs** and **f-MRAVs** in actuation, maneuverability, and communication capability.
- Show how communication objectives can be integrated into **modeling, planning, and control**.

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Key Points

- Full actuation **decouples motion and orientation**.
- This enables **antenna alignment** and full-pose regulation during motion.

Takeaways, Open Problems, and Questions

Takeaway Message

Communication objectives should be integrated into **modeling, planning, and control**, and **f-MRAVs** expand what is feasible by **decoupling motion and orientation**.

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Open Problems

- **Robustness** to uncertainty and real-world disturbances.
- **Scalability** of communication-aware planning and control.
- **Deployment** under sensing, actuation, and feasibility constraints.

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Communication objectives should be integrated into **modeling, planning, and control**, and **f-MRAVs** expand what is feasible by **decoupling motion and orientation**.

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Questions We Want to Answer

- When is **full-pose regulation** necessary?
- What does **full actuation** enable beyond conventional MRAVs?
- How should **communication metrics** shape **control design**?

NOTE: Questions will be addressed **at the end of each part** and in the **final discussion**.

| From | To | Time | Description |
|--|-------|------|---|
| Part 1: Welcome and Overview (10 min) | | | |
| 09:00 | 09:05 | 5' | Motivation, tutorial scope, structure, and speakers |
| Part 2: Multi-Rotor Aerial Vehicle (MRAV)-Enabled Wireless Systems and Channel Effects (50 min) | | | |
| 09:05 | 09:25 | 20' | Overview of MRAV-enabled wireless communication scenarios |
| 09:25 | 09:55 | 30' | Mobility-, orientation-, and airframe-aware channel modeling + Q&A |
| Part 3: Communications-Aware Control with Underactuated MRAVs (95 min) | | | |
| 09:55 | 10:10 | 15' | Dynamic modeling and control properties of underactuated MRAV |
| 10:10 | 10:30 | 20' | Communications-aware trajectory planning formulations |
| 10:30 | 10:45 | 15' | Representative use cases and performance trade-offs |
| 10:45 | 11:00 | 15' | Discussion: limitations due to actuation and pose coupling + Q&A |
| 11:00 | 11:30 | 30' | Break |
| Part 4: Communications-Aware Control with Omnidirectional MRAVs (90 min) | | | |
| 11:30 | 11:45 | 15' | Modeling and control of omnidirectional (fully-actuated) MRAVs |
| 11:45 | 12:05 | 20' | Pose optimization versus position-only planning |
| 12:05 | 12:30 | 25' | Communications-aware control enabled by full pose regulation |
| 12:30 | 13:00 | 30' | Open challenges, future directions, and extended discussion + Q&A |
| End of Tutorial Session | | | |

Thank you

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