

Dr Hae-In Lee

Centre for Autonomous and
Cyber-Physical Systems



2019 International Workshop

On Research, Education and Development
On Unmanned Aerial Systems (RED UAS 2019)

3 December 2019





Overview

- **Location:** Cranfield University, UK
- **Date:** 25-27 November 2019
- **Objectives:**
 - Bringing together representatives from academia, industry, or government agencies working in the rapidly expanding research area of **Unmanned Aerial Vehicles**
 - Special emphasis to current and future research opportunities
- **Programme:**
 - 13 regular sessions
 - 4 plenary sessions
 - 2 industrial sessions
 - 1 tutorial session





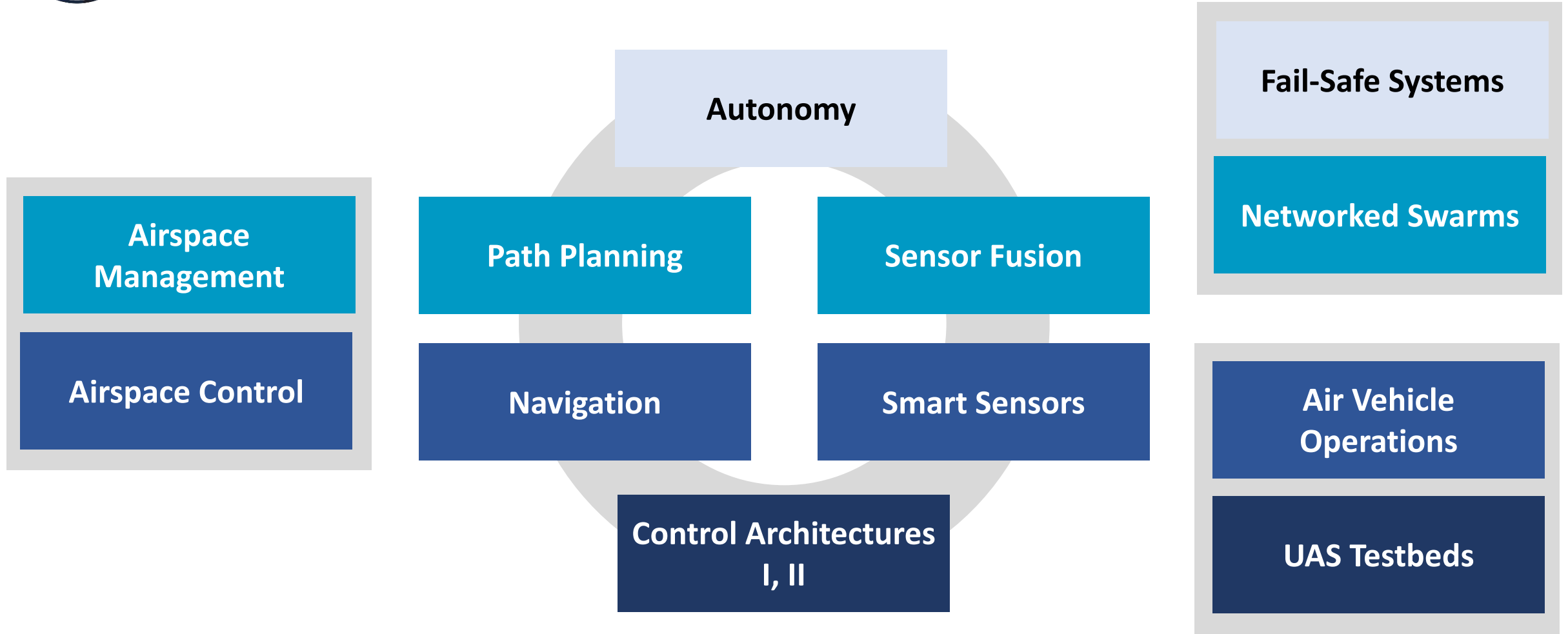
Regular Sessions (1/3)

- **Research papers** from academia/industry
 - 49 papers into 13 sessions & 2 tracks
 - 12 countries
 - 20 affiliations



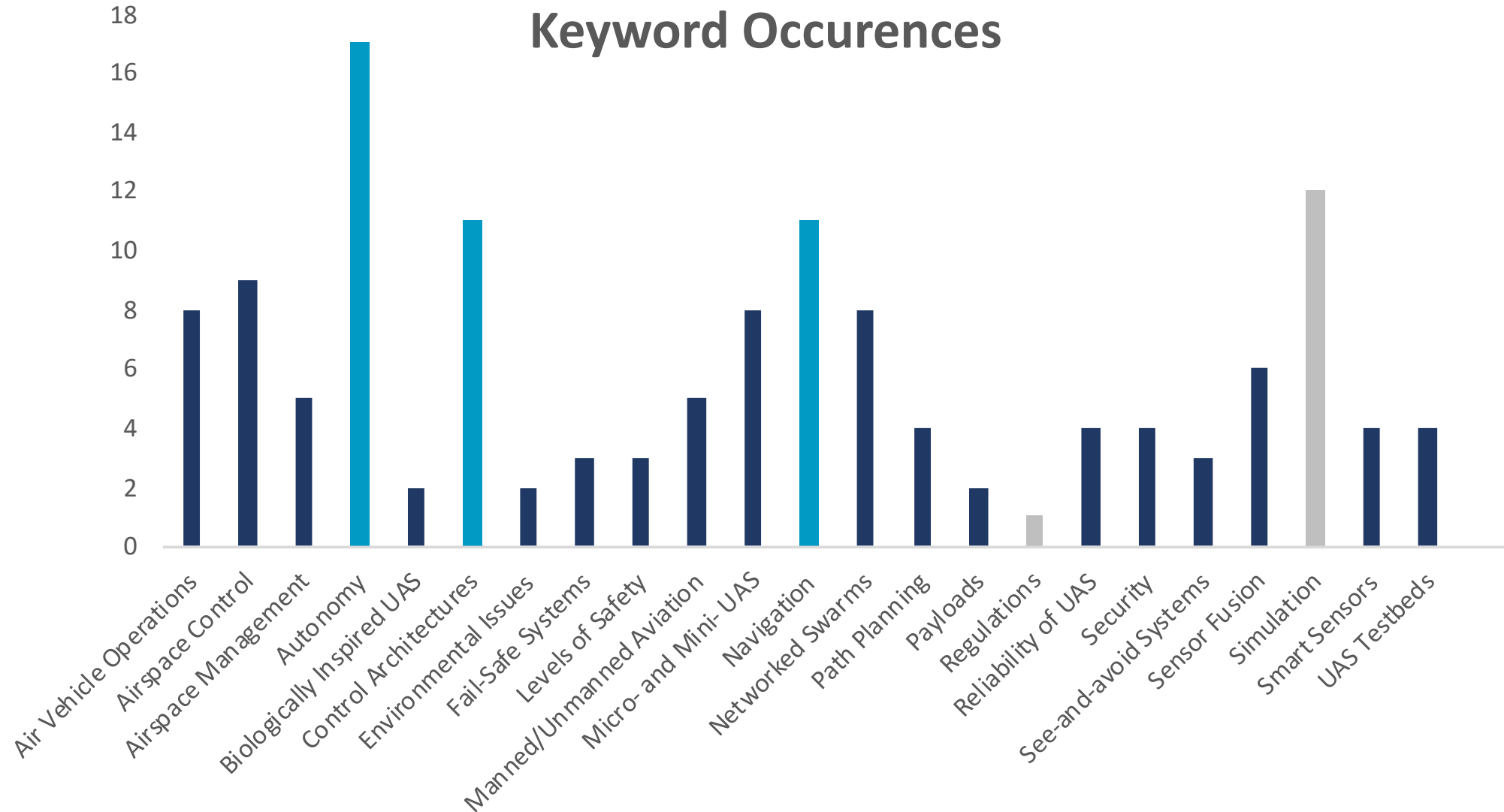


Regular Sessions (2/3)





Regular Sessions (3/3)

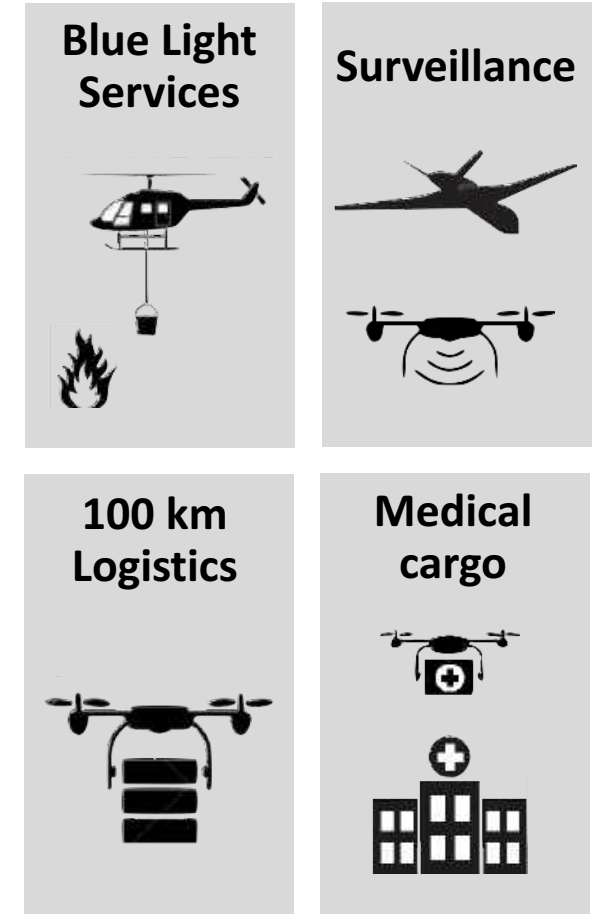




Plenary Sessions (1/3)

EuroDRONE: An Autonomous UTM Demonstrator

- **Presenter:** Prof Vaios Lappas (University of Patras)
- U-space project with international partners
- Layer 1: Demonstrate all U1 functionalities in Greece/Messologhi
- Layer 2: Urban airspace design, airspace management, emergency management service and risk assessment
- Layer 3: Demonstrate Vehicle-to-Infrastructure communication (4G) / Detect and Avoid





Plenary Sessions (2/3)

Unmanned Systems Are NOT Unmanned Systems

- **Presenter:** Prof Alvin Wilby (Thales)
- Issues that were in manned aircrafts, and still in unmanned aircrafts
 - Thrust reversers
- Issues that arise differently in unmanned aircrafts
 - Pitot tube blockage
- Drawing the system boundary in the right place

Safe, Secure and Sustainable

- **Presenter:** Prof Graham Braithwaite (Cranfield University)
- Safety & accident investigations

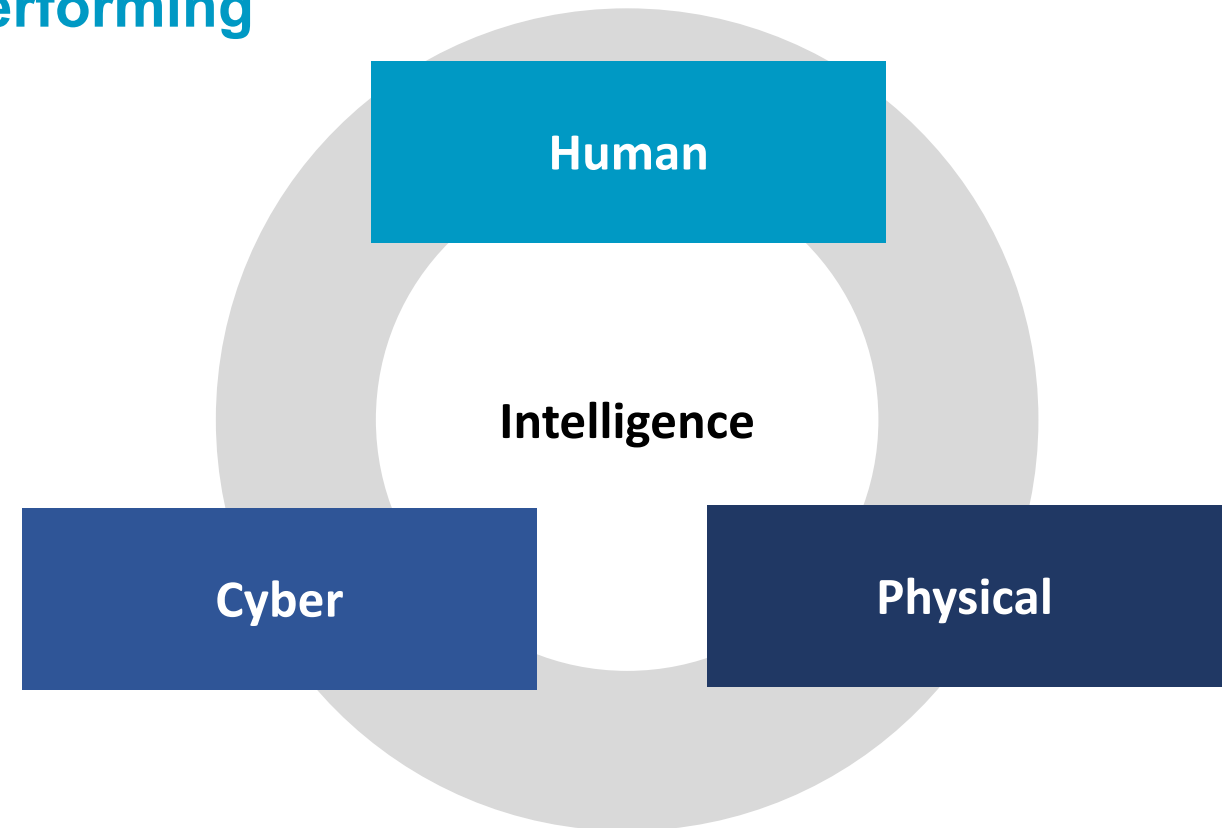




Plenary Sessions (3/3)

Busy Bees in the Sky: Explainable AI for Trustworthy UAVs Performing Sensing and Communication Tasks

- **Presenter:** Prof Weisi Guo (Cranfield University)
- Vision of Socio-Cyber-Physical Ecosystems
- Human Machine Trust for UAV enabled ICT
 - Future engineering challenges: networked systems, AI, UAVs
 - UAV networked sparse sensing
 - UAV communications in 5G & Beyond





Industrial Sessions (1/2)

UAVs and Robots in the Inspection of Aircraft Structures

- **Presenter:** Dr Nicolas P. Avdelidis (InnoTecUK & Universite Laval)
- Wing panel inspections via drones for mobility, safety, and efficiency



UK Drone Pathfinder Programme

- **Presenter:** Miss Maysun Hassanaly (Connected Places Catapult)
- Programme to progress in drone technology and regulation, bringing industry, academia, end users and authorities together





Industrial Sessions (2/2)

Trip Allocation in Ride-Sharing Mobility As a Service Simulations

- **Presenter:** Dr Pau Segui-Gasco (Immense)
- Decision making on allocating trips to vehicles in large scale

Drone Docking Station Technology for Remote and Continuous Aerial Operations

- **Presenter:** Mr Edward Anastassacos (HEROTECH8)
- Broadening the UAS applicability

How the Aerospace Industry Can Increase Productivity and Safety Whilst Reducing Costs, through the Adoption of UAV / NDT Orientated Technologies

- **Presenter:** Mrs Anna Plaster (OASIS)
- Drones to carry out quicker, safer and cheaper aircraft structure inspections



AIRBUS





Tutorial Session

Workshop: Fundamentals of Modeling and Control of UAVs - a Comprehensive Approach

- **Presenter:** Prof Kimon P. Valavanis (University of Denver)
- Review of rigid body motions – kinematics and dynamics
- Unmanned rotorcrafts
 - Control fundamentals of rotorcrafts
 - Rotorcraft identification
- Circulation control UAV
 - Fixed-wing identification
 - Nonlinear control of fixed-wing UAVs





Conclusion

- Bringing together **academia, industries and authorities** to share research challenges and interests

- **Current UAS researches:**
 - **Framework/capabilities** for UTM – ensuring safety & efficiency in unsegregated airspace
 - Enhancing the level of **autonomy** – GNC, estimation, AI, and decision making algorithms
 - Emphasis on **networked** swarms and **fail-safe** systems
 - Testbeds for initial implementation

- **Future UAS research opportunities:**
 - Still a long way to go for safe, secure, and fully autonomous UAS operations
 - Broadening UAS applications & operational environments – aerial inspections, manipulators, logistics in GPS-denied/urban environments
 - Issue on validation & verification (trust in AI)



Thank you!

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