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Sultan Qaboos University

College of Engineering • كليـــــة الهندســـــة

كلية الهندسة
College of Engineering

IEEE
OMAN SECTION

UVS-OMAN 2026 CONFERENCE

9-11 FEB 2026

SULTAN QABOOS UNIVERSITY MUSCAT

3rd International Conference on Unmanned Vehicle Systems

Intelligent Systems for Industrial Challenges

BOOK OF ABSTRACTS

9-11 Feb 2026

Sultan Qaboos University

Muscat, Oman

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Muscat, Oman

Conference Organization
College of Engineering
Sultan Qaboos University

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Welcome Message

Prof. Hadj Bourdoucen
Organizing Committee Chair

It is our great pleasure to welcome you to the 3rd International Conference on Unmanned Vehicle Systems (UVSC 2026), held in Muscat from 9 to 11 February 2026. This year's edition continues our mission of advancing knowledge, strengthening collaboration, and building national capacity in the rapidly evolving fields of unmanned and autonomous systems. By bringing together researchers, industry experts, practitioners, regulators, and students, the conference provides a platform for exchanging ideas, sharing experiences, and exploring innovations that are shaping the future of UVS technologies.

The UVSC 2026 program features a rich set of activities designed to capture the breadth and depth of this dynamic field. On 9 February, three specialized workshops will be held, each addressing a key dimension of unmanned systems development and applications:

- **Workshop 1:** Evolution of Drones and Their AI & Sensing Technologies with a Focus on Inspections in the Oil & Gas Industry
- **Workshop 2:** Robust Motion Control of Autonomous Underwater Vehicles
- **Workshop 3:** Anti UAV Systems: Technology, Operations, and Use Cases

The conference will also feature two distinguished keynote addresses:

- **Keynote I:** The Changing Cybersecurity Requirements in the Autonomous Era: When Can We Expect Level 5 Autonomy?
- **Keynote II:** Design, Control, and Applications of Bioinspired Drones
-

Complementing the keynotes are three invited talks that explore high impact themes of regional and global relevance:

- **Invited Talk I:** The Future of Defense: Advances and Trends in Military Drone Technology
- **Invited Talk II:** From Import to Innovation: Localizing UAV Development in Oman
- **Invited Talk III:** From Vision to Impact: Building AI and Drone Capabilities at the EIVS Lab

In addition, the program includes:

- **Industry Applications I & 2:** Ten use cases from Omani industry on "Aerial Robotics for Inspection, Monitoring, and Environmental Assurance" and on "Autonomous Systems for Safety, Inspection, and Operations" respectively.

- **Parallel Scientific Sessions:** Six parallel sessions featuring peer reviewed technical papers aligned with the conference theme.

The conference is technically sponsored by the IEEE Oman Section, and accepted papers that meet IEEE requirements will be published in IEEE Xplore. Additionally, three student competitions on drones and robots will take place during the event.

The Organizing Committee extends its sincere gratitude to all sponsors, partners, presenters, reviewers, and participants for their invaluable contributions to making UVSC 2026 an engaging and impactful event. Your dedication and expertise are essential to advancing innovation and shaping the future of unmanned vehicle systems.

On behalf of the organizing committee, I warmly welcome you to UVSC 2026. I wish you fruitful discussions, productive collaborations, and an enjoyable experience during your time in Muscat.

Committees

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The range of targeted topics is very broad, but priority is given to subjects on real world applications; including: research, industry, business, and education. The Technical Program Committee is inviting proposals for paper presentations, demonstrations, and poster contributions on topic relevant to UVS.

Conference Tracks:

- **Technological Advances in Unmanned Vehicle Systems and Robotics**
- **Intelligent Navigation, Control, and Decision-Making**
- **Applications and Use-Cases of UVS and Robotics in Industry and the Public Sector**
- **Integration with IoT, Smart Cities, and Urban Mobility**
- **Data Analytics, Cybersecurity, and System Resilience**
- **Education and Training of Unmanned Vehicle Systems (UVS) and Robotics**
- **Regulatory, Ethical, and Societal Implications**
- **Challenges and Future Trends in UVS and Robotics**

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Conference - Day 1

Workshops

Monday, 9th February

College of Engineering, SQU

08:00 - 08:30	**Welcome & Registration**
08:30 – 10:00	**Workshop A** *Workshop Chair : Dr. Amur Al-Yahmadi* **Evolution of Drones and Their AI & Sensing Technologies with focus on various Inspections in the Oil & Gas Industry** Presenters (ESBAAR): *Hassan Al Lawati, Maha Al Salti, Mohamed Al Hinai, and Enas Haddad*
08:30 – 10:00	**Workshop B** *Workshop Chair: Dr. Naser Tarhuni* **Robust Motion Control of Autonomous Underwater Vehicles** Presenter: *Dr. Ahmed Chemori, LIRMM University of Montpellier, CNRS, France*
08:30 – 10:00	**Workshop C** *Workshop Chair: Dr. Taha Al-Saadi* **Anti-UAV Systems: Technology, Operations and Use Cases** Presenter: *Dr. Mansur Celebi, Sinan Advanced Industries*
10:00 - 10:30	**Tea/Coffee Break**
10:30-12:30	**Workshop A [Cont.]** **Evolution of Drones and Their AI & Sensing Technologies with focus on various Inspections in the Oil & Gas Industry** Presenters (ESBAAR): *Hassan Al Lawati, Maha Al Salti, Mohamed Al Hinai, and Enas Haddad*
10:30-12:30	**Workshop B [Cont.]** **Robust Motion Control of Autonomous Underwater Vehicles** Presenter: Dr. Ahmed Chemori, LIRMM University of Montpellier, CNRS, Franc
10:30-12:30	**Workshop C [Cont.]** **Anti-UAV Systems: Technology, Operations and Use Cases** Presenter: *Dr. Mansur Celebi, Sinan Advanced Industries*
12:30 - 14:00	**Lunch Break**
14:00-16:00	**Workshop A [Cont.]** **Evolution of Drones and Their AI & Sensing Technologies with focus on various Inspections in the Oil & Gas Industry** Presenters (ESBAAR): *Hassan Al Lawati, Maha Al Salti, Mohamed Al Hinai, and Enas Haddad*

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Conference - Day 2

Tuesday, 10th February 2026
Conference & Exhibition Halls, SQU

08:00 - 08:45	**Registration**
08:45 - 08:50	**Recitation of Holy Quran**
08:50 - 09:00	**Welcome Address by the Dean**
09:00 - 09:10	**Opening Remarks by the Chair, Organizing Committee**
09:10 - 09:30	**Announcement of Design Competition Winners**
09:30 - 10:00	**Opening of Exhibition**
10:00 - 10:30	**Tea/Coffee Break**
10:30 - 11:15 **(35 min + 10 min Q&A)**	**Keynote I** *Chair: Prof Hadj Bourdoucen* **The Changing Cybersecurity Requirements in the Autonomous Era: When Can We Expect Level 5 Autonomy?** **Presenter:** Dr. Hans C. Mumm *Leader in Emerging and Disruptive Technologies; Former Division Chief for Cybersecurity, Office of the Director of National Intelligence (ODNI), USA*
11:20 – 12:35	**Industry Applications I — Aerial Robotics for Inspection, Monitoring, and Environmental Assurance** *Chair: Dr. Alya Al-Hashim*
11:20 - 11:35 **(10 min + 05 min Q&A)**	**Industry Application (PDO)** **Enhancing Powerline Inspection Through Multi-Sensor Drone Technology at PDO.** ***Presenter:*** *Naseer Al-Bulushi*
11:35 - 11:50 **(10 min + 05 min Q&A)**	**Industry Application (OQGN)** **AI-Assisted BVLOS Drone for Right-of-Way Inspection** ***Presenter:*** *Nuha Al-Badi, Hiba Al Shuaibi*
11:50 - 12:05 **(10 min + 05 min Q&A)**	**Industry Application (OLNG)** **Tackling Methane in Flight: Drone Technology Experience in Methane Management** ***Presenter:*** *Firdouse Al Barwani*
12:05 - 12:20 **(10 min + 05 min Q&A)**	**Industry Application (NAMA / OETC)** **Aerial Inspection for Overhead Transmission Lines** **Presenter:** Sulaiman Al Shuaili
12:20 - 12:35 **(10 min + 05 min Q&A)**	**Industry Application (Vale Oman)** **Confined Space Inspection Using Drone Technology** ***Presenters:*** *Adnan Al Sheidi, Ali Khamis Al Kharusi, and Mohammed Al Balushi*

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Conference - Day 2 [*Cont.*]

Tuesday, 10th February 2026
Conference & Exhibition Halls, SQU

12:35 - 13:05 **(25 min + 05 min Q&A)**	**Invited Talk I** *Chair: Dr. Nasr Al Hinai* **The Future of Defense: Advances and Trends in Military Drone Technology** **Presenter:** Prof. Muhammet Deveci *Turkish Naval Academy (National Defense University), Turkey*	
13:05 - 14:15	**Lunch Break**	
14:20 – 16:00	**Parallel Session # 1** *Chair: Dr. Nasra al-Maskari*	**Parallel Session # 2** *Chair: Dr. Riadh Zaier*
14:20 - 14:40 **(15 min + 05 min Q&A)**	**Design and Implementation of a Hybrid Fuel Cell-Battery-Supercapacitor System for the Long-Endurance Stork UAV** Tedjani Mesbahi, Thomas Pavot, Renaud Kiefer, Edouard Laroche (France)	**Prescribed Performance Cooperative Design for the UAV-UGV System: Vision-based Guidance Control Approach** Jawhar Ghommam (Oman), Ibrahim Naimi (Oman), Saif-sinan Al-Abduljaleel Saif (Canada), Maarouf Saad (Canada)
14:40 - 15:00 **(15 min + 05 min Q&A)**	**Early Exiting U-Net for Efficient Processing on UAVs: A Case Study in Environmental Monitoring** Luca Sartori Boni, Mohamed Moursi, Norbert Wehn, Bilal Hammoud (Germany)	**Resilient Reconfiguration and Fault-Tolerant Cooperative Control of MAS under Permanent Link Failures within a Hybrid-Systems Framework** Estrada Jonathan (France), Mohamed Djemai (France), Bernardino Castillo-Toledo (Mixico), Michael Defoort (France)
15:00 - 15:20 **(15 min + 05 min Q&A)**	**A Robust Model-Based Corrector Iterative Learning Control for Mecanum Robots: Comparative Analysis of Adaptive Architectures** Nayan Banik (USA), Jawhar Ghommam (Oman), Mohammad habibur Rahman (USA)	**Sustainable Flight Path Optimization for UAVs in Variable Environments** Keerthana Perumal (Oman)
15:20 - 15:40 **(15 min + 05 min Q&A)**	**Design Methodology and Aerodynamic Validation of an In-House 3D-Printed Fixed-Wing UAV Using XFLR5 and CFD Simulation** Hamed Al Subhi, Nasra Al-Maskari (Oman)	**Drone-based Estimation of Chlorophyll-a in Reservoirs: A Cubist-based Ensemble Model** Soheil Ghasemnezhad (Iran), Mohammad Reza Nikoo (Oman), Mahmoud Mashal (Iran), Malik Al-Wardy (Oman)
15:40 - 16:00 **(15 min + 5 min Q&A)**	**Experimental Validation of Finite-Time Robust Control for Autonomous Vehicles using Qcar** Younes Lahiouel (Canada), Yassine Kali (Canada), Maarouf Saad (Canada), Baptiste Bancel (Canada), Jawhar Ghommam (Oman).	**AI-Enabled Unmanned Vehicle Systems for Transforming Healthcare Delivery: Strategic Applications and Roadmap for Oman's Public Health System** Anas Ansari (Taiwan), Abdullah Ansari (Oman), Khalifa Al Jabri (Oman), Jing-Ming Guo (Taiwan), Abdul Rahman Ansari (India), H.E. Khodke (India)

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Conference - Day 3

Wednesday, 11th of February 2026
Conference & Exhibition Halls, SQU

08:30 – 09:15 **(35 min + 10 min Q&A)**	**Keynote II** *Chair: Dr. Said Al-Abri* **Design, Control, and Applications of Bioinspired Drones** Presenter: Prof. Dario Floreano *Director, Laboratory of Intelligent Systems* *École Polytechnique Fédérale de Lausanne (EPFL), Switzerland*	
09:20 - 9:50 **(25 min + 5 min Q&A)**	***Invited Talk II*** *Chair: Prof. Lazhar Kheriji* ***From Import to Innovation: Localizing UAV Development in Oman*** *Presenter: Engr. Majid Al-Hinai* *CEO of Sinan Advanced Industries, Oman*	
10:00 - 10:30	**Tea/Coffee Break**	
10:30 – 10:45	**Industry Applications II** *Chair: Dr. Rashid Al-Hajri* Autonomous Systems for Safety, Inspection, and Operations	
10:30 - 10:45 **(10 min + 5 min Q&A)**	**Industry Application (SOHAR Port & Freezone): Underwater Inspection of Marine Assets Using ROVs** Presenter: Musaab Al-Maqbali	
10:45 - 11:00 **(10 min + 5 min Q&A)**	**Industry Application (OQGN): Tethered Drone for Emergency Response** Presenter: Nuha Al-Badi	
11:15 - 11:30 **(10 min + 5 min Q&A)**	**Industry Application (PDO): Validating Robots for Routine Assurance Tasks in PDO** Presenter: Issam Alnaaimi	
11:30 - 11:45 **(10 min + 5 min Q&A)**	**Industry Application (Sohar Aluminium): Intelligent Navigation, Control, and Decision-Making through IVMS and Driver Fatigue Management Systems** Presenter: Muktesh SARPOTDAR	
11:45 - 12:00 **(10 min + 5 min Q&A)**	**Industry Application (ESBAAR): Automating Oil and Gas Operations using Autonomous Drone Stations** Presenter: Eng.Mohamed Al Hinai	
12:00 – 13:00	**Parallel Session # 3** *Chair: Dr. Ibrahim Al-Naimi*	**Parallel Session # 4** *Chair: Dr. Majid Al-Maharbi*
12:00 – 12:20 **(15 min + 5 min Q&A)**	**DookFlight: A Drone Simulator Platform for Studying Advanced Controllers** Navid Nasiri (Oman), Morteza Mohammadzaheri (Oman)	**Transportation of the future: the idea behind the integration of alternative energy sources and autonomous systems** Agnes Csiszárik-Kocsir (Hungary), János Varga (Hungary)
12:20 – 12:40 **(15 min + 5 min Q&A)**	**Reliability Analysis of Aeronautical Structures: A Stochastic Approach to Periodic Structures** Mohamed Guedri (Tunisia)	**Integrated UAV-based Mapping and Cloud-Based System for Digital Twin Creation of Historical Sites: A Case Study of Mutrah Fort** Mohammed Eldiasty (Oman), Alya Al-Hashim (Oman)
12:40– 13:00 **(15 min + 5 min Q&A)**	**Practical PID Tuning for Quadcopter Stability: Experimental Results** Aybak Ahmad (Jordan), Sereen N Alzu'bi (Jordan), Tarek A. Tutunji (Jordan)	

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Conference - Day 3 [*Cont.*]

Wednesday, 11th of February 2026
Conference & Exhibition Halls, SQU

13:00 – 14:10	**Lunch Break**	
14:10 – 14:40 **(25 min + 5 min Q&A)**	**Invited Talk III** *Chair: Dr. Mansur Celebi* **From Vision to Impact: Building AI and Drone Capabilities at the EIVS Lab** Presenter: Dr. Ahmed Al-Maashri *Head, Department of Electrical & Computer Engineering* *Sultan Qaboos University, Oman*	
14:40 – 16:00	**Parallel Session # 5** *Chair: Dr. Majdi Mansouri*	**Parallel Session # 6** *Chair: Dr. Jawhar Ghommam*
14:40- 15:00 **(15 min + 5 min Q&A)**	**Auto Road Inspector: Road Damage Recognition and Reporting System** Wahaj Hoti (Oman), Asma Ismail Al Balushi (Oman), Ruba Said Al Humaidi (Oman), Ragavesh Dhandapani (Oman)	**YOLO-Powered UAV Imaging for Precise Detection of Fungal Infections in Palm Trees** Omer Eldirdiry (Oman), Mawadda Khalifa Alwardi (Oman), Alhasan Hilal Alshekaili (Oman), Hamza Abdullah Alismaili (Oman), Alwaleed Aldahmani (Oman)
15:00 – 15:20 **(15 min + 5 min Q&A)**	**Real-Time Fault Detection and Reconstruction for Autonomous Vehicles: A KPCA Digital Twin Approach** Romdhane Nasri (Tunisia), Majdi Mansouri (Oman), Zouhaier Affi (Tunisia), Vicenç Puig (France)	**Drone Thermal Cameras System for Accurate Temperature Measurements in Oil Fields Using AI** Salim Almamari (Oman), Moudafer Alwahibi, (Oman), Abdullah Alshehhi (Oman), Ahmed Tabook (Oman), Ahmed Al Maashri (Oman), Hadj Bourdoucen (Oman)
15:20 – 15:40 **(15 min + 5 min Q&A)**	**Stable Fault-Tolerant Control for Autonomous Vehicles: Model Predictive Control with Digital Twin Integration** Romdhane Nasri (Tunisia), Majdi Mansouri (Oman), Zouhaier Affi (Tunisia), Vicenç Puig (France)	**Assessment of Drone Imagery for Water Quality Estimation in Wadi Dayqah Reservoir** Sadegh Nehi (Iran), Mohammad Reza Nikoo (Oman), Malik Al-Wardy (Oman), Sadegh Vanda (Iran), R. Kerachian (Iran), Navid Nasiri (Oman)
15:40 – 16:00 **(15 min + 5 min Q&A)**	**Machine Learning-Based Fault Classification for KPCA Digital Twin Model Predictive Control in Autonomous Vehicles** Romdhane Nasri (Tunisia), Majdi Mansouri (Oman), Zouhaier Affi (Tunisia), Vicenç Puig (France)	**Traffic congestion perdition using vehicle trajectories from Drone and combined Graph Attention and Temporal Convolutional Network** Hana Gharrad (France), Nesrine Ouled Abdallah

Conference Banquet

Wednesday, 11th of February 2026
Novotel Muscat Airport

3rd International Conference on Unmanned Vehicle Systems
Intelligent Systems for Industrial Challenges

Keynote & Invited Speakers

Keynote Speaker
Dr. Hans C. Mumm

Bio: Dr. Mumm has spent thirty-one years in government and contractor service, building teams to address complex problems in national security, homeland security, and advanced technologies. He was the Division Chief for Cybersecurity at the Office of the Director of National Intelligence (ODNI), programming and executing a budget of over $ 140 million. He developed a unique set of continuous monitoring capabilities and the rogue wireless detection capability that supported the ICD-503 Risk Management Framework.

Dr. Mumm is a proven leader in diverse fields, including autonomous systems, post-quantum cybersecurity, AI and machine learning, advanced fuel systems, cognitive scientific research, and all aspects of the military intelligence community. He has thirteen published books, dozens of white papers, and numerous research studies to his credit in both the scientific and social science arenas.

He has notable experience in research and systems engineering, including winning awards and contracts for UAV (autonomous systems) research and creating an advanced, multiple-fuel system (AI-based), where he operated the world's first and only helicopter that flies on five separate fuels without engine modifications. His research extends into emerging and disruptive technologies for both offensive and defensive missions, supporting US and coalition operations. His UAV and robotics expertise has focused on determining the specific uses, exceptions, and allowances for robotics operations, including studying the unintended consequences, future use, and misuse of such technologies.

The Changing Cybersecurity Requirements in the New Autonomous World: When Can We Expect Level 5 Autonomy?

This keynote will examine the evolving cybersecurity requirements in the emerging world of autonomous systems and cybersecurity integration, as well as the impact of AI/autonomous applications on warfare, healthcare, transportation, security, and education. There are currently eight recognized layers of unmanned autonomous systems that will soon communicate and integrate to form a new architecture. These autonomous architectures and required cybersecurity protocols are outpacing the ability to draft and approve policies, laws, and governance necessary for autonomous technologies. The discussion will also include early predictions on the positive and negative impacts on our global society. Cybersecurity is the critical element for success in the next industrial revolution.

Keynote Speaker
Prof. Dario Floreano

Bio: Dario Floreano is director of the Laboratory of Intelligent Systems at Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland. He has been the founding director of the Swiss National Center of Competence in Robotics from 2010 to 2022. Prof. Floreano made pioneering contributions to the fields of evolutionary robotics, aerial robotics, and soft robotics. He held visiting positions at Sony Computer Science Laboratory, at Caltech/JPL, at Harvard University, and Osaka University. He co-authored more than 500 publications and 5 books by MIT Press and Springer Verlag, spun off 3 drone companies, and is in the editorial board of several journals, including Science Robotics. He is a Fellow of the IEEE Robotics and Automation Society and of the European Lab for Learning and Intelligent Systems (ELLIS).

Design, control, and applications of bioinspired drones

Abstract: Drones have taken the world by storm. In the past 15 years, small autonomous flyers have had a major impact in inspection, security, rescue, logistics, and entertainment. However, today's commercial drones cannot yet compete with flying animals in terms of mechanical resilience, adaptability, and cooperation. For example, multi-copters are very agile, but spend most of their energy to fight gravity; in contrast, winged drones offer almost twice as much endurance than multi-copters for the same mass but require more space and time to change direction. I will describe recent research addressing these challenges that takes inspiration from insects and birds, describe how such drones can be used to explain poorly understood biological mechanisms, and show examples of translation into commercial products. Finally, I will point out open challenges in design, modeling, and control of future drone systems.

Invited Speaker

Prof. Muhammet Deveci

Bio: Muhammet Deveci is a Full Professor at the Department of Industrial Engineering in the Turkish Naval Academy, National Defence University, Istanbul, Turkey, and he is Honorary Senior Research Fellow with the Bartlett School of Sustainable Construction, University College London, UK. Dr. He worked as a Visiting Researcher and Postdoctoral Researcher, in 2014-2015 and 2018–2019, respectively, with the School of Computer Science, University of Nottingham, Nottingham, U.K. Dr Deveci is an outstanding researcher and a prolific author who has been publishing high quality peer-reviewed papers in highly ISI ranked journals and reputable international conferences. Dr. Deveci has published over 399 papers in journals indexed by SCI/SCI-E papers at reputable venues, as well as more than 30 contributions in International Conferences related to his areas. Dr. Deveci received the 100th-anniversary award for his worldwide scientific achievements from the Scientific and Technological Research Council of Turkey (TUBITAK). Dr Deveci has also been engaged with the wider community providing academic service through chairing/organising conferences, streams, tutorials, reviewing papers, and acting as Editorial Board Member of well-known journals including IEEE TFS, IEEE T-IV, IEEE TETCI, Engineering Applications of Artificial Intelligence, and more. Dr Deveci is an internationally recognized outstanding scientist in intelligent decision support systems underpinned by computational intelligence, particularly uncertainty handling, fuzzy systems, combinatorial optimization, and multicriteria decision making.

The Future of Defense: Advances and Trends in Military Drone Technology

Abstract: Military drone technology is rapidly transforming modern defense systems and reshaping the nature of warfare. Advances in Unmanned Aerial Vehicles (UAVs) have significantly expanded their roles beyond traditional intelligence, surveillance, and reconnaissance missions to include precision strike, electronic warfare, logistics support, and cooperative swarm operations. Recent developments in artificial intelligence and machine learning enable drones to operate with higher levels of autonomy, improving decision-making speed, adaptability, and mission effectiveness in complex environments. This talk will discuss the key technological shifts and operational requirements shaping the development of future military UAVs.

Invited Speaker

Eng. Majid Al-Hinai

Bio: Majid Al-Hinai is the Chief Executive Officer of Sinan Advanced Industries and its subsidiaries, leading the government-owned technology company in alignment with Oman's Vision 2040. With 19 years of experience in local and international roles across the oil and gas and manufacturing sectors, including key positions in Oman, the USA, and China, Al-Hinai brings extensive expertise to his leadership. He is dedicated to advancing technological expertise, innovative product design, and specialized training programs that enhance in-country value by creating job opportunities and integrating cutting-edge manufacturing technologies. Under his leadership, Sinan Advanced Industries has grown into a prominent technology company by implementing automation and fostering local talent development, significantly contributing to Oman's industrial growth. Al-Hinai holds a Bachelor of Science in Mechatronics Engineering from Sultan Qaboos University and an MBA from The Open University. He also serves as an advisory board member for the Mechatronics program at Sultan Qaboos University.

From Import to Innovation: Localizing UAV Development in Oman

Abstract: This talk outlines a decisive approach to localizing UAV manufacturing in Oman, shifting from reliance on imported systems to controlled, domestic production. It focuses on strengthening supply chains, securing technological sovereignty, and building national capabilities through phased localization. Beginning with assembly and customization and advancing toward full airframe and systems manufacturing supported by strategic international partnerships.

The address highlights the infrastructure, talent, and policy enablers required to scale a sustainable drone industry, while emphasizing economic impact through skilled job creation, export potential, and industrial diversification. The vision positions Oman as a competitive regional center for UAV manufacturing and advanced autonomous systems aligned with long-term national development objectives.

Invited Speaker

Dr. Ahmed Al-Maashri

Bio: Ahmed Al-Maashri is an Associate Professor and the Head of the Department of Electrical & Computer Engineering at Sultan Qaboos University. Ahmed holds a PhD in Computer Science and Engineering from the Pennsylvania State University – USA, a Master of Information Science in Internetworking from the University of New South Wales – Australia, and a Bachelor in Electrical & Electronics Engineering from Sultan Qaboos University – Oman. Ahmed has over 20 years of academic experience. He is a senior IEEE member, the founder of the IEEE Oman Computer Chapter, and the current Chair of the IEEE Oman Section. He is the current Chair of the Committee for Artificial Intelligence Experts, under the Ministry of Transport, Communications, and Information Technology.

Ahmed has published journal and conference papers in the areas of Computer Architecture, Reconfigurable Computing, Embedded Systems, Digital Logic, Wireless Networks, Artificial Intelligence, and Unmanned Vehicle Systems. He has co-founded the Embedded & Interconnected Vision Systems Laboratory, a unique and one-of-a-kind laboratory in the region. He is a two-time recipient of the National Research Award in the ICT sector. Sultan Qaboos University recognized him with the Best Teacher and Researcher Awards.

Ahmed's recent focus is on Artificial Intelligence, Unmanned Aerial Vehicles, Embedded Vision Systems, and designing hardware accelerators to speed up the performance of such systems.

Title: From Vision to Impact: Building AI and Drone Capabilities at the EIVS Lab

Abstract: Abstract: This talk shares the story of the EIVS lab, a hub for educators, scholars, and enthusiasts of advanced technologies, including unmanned vehicles. The talk will showcase how the EIVS lab helped build capacity at the College of Engineering in both drones and AI. Furthermore, the talk will showcase some of the success stories.

3rd International Conference on Unmanned Vehicle Systems

Intelligent Systems for Industrial Challenges

Workshops

Workshops

Workshop A

Evolution of Drones and Their AI & Sensing Technologies with focus on various Inspections in the Oil & Gas Industry

Presenter

ESBAAR
Drone inspections, AI solutions, and Surveys Company, Oman

Workshop B

Robust Motion Control of Autonomous Underwater Vehicles

Presenter

Dr. Ahmed Chemori
(LIRMM University of Montpellier, CNRS, France)

Workshop C

Anti-UAV Systems:
Technology, Operations and Use Cases

Presenters

Dr. Mansur Celebi
(Vice President, Sinan Advanced Industries)

UVS-OMAN 2026 CONFERENCE
SULTAN QABOOS UNIVERSITY
9-11 FEB 2026 MUSCAT

IEEE OMAN SECTION

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Intelligent Systems for Industrial Challenges

Unmanned Autonomous Car (UAC26) Competitions

Open to teams from schools in grades 7-12
Open to teams from Universities and Colleges

Competitions

Sultan Qaboos University, through its esteemed College of Engineering, is proud to organize two distinguished competitions in conjunction with the 3rd International Conference on Unmanned Vehicle Systems (UVS-Oman 2026). The events will be held from February 9 to 11, 2026.

The Students' Unmanned Autonomous Car Competition (UAC26) is open to university-level teams and challenges participants to design, build, and race a fully autonomous vehicle through a dynamic and constrained race track. The arena is meticulously designed to simulate real-world car racing scenarios, offering an immersive and realistic environment for testing and demonstrating autonomous driving capabilities. The competition fosters innovation, technical skill, and problem-solving among participants, providing an outstanding platform to showcase their expertise. The top three winners will receive prizes of 1000 OMR for first place, 600 OMR for second place, and 400 OMR for third place, along with distinguished recognition.

In addition, the competition for school teams spanning grades 7 through 12 invites young students to engage with unmanned autonomous car technology. Participants are tasked with designing an innovative autonomous car capable of navigating an arena that replicates realistic road conditions. The competition is divided into three levels, each presenting unique challenges such as maneuvering turns, pedestrian detection, bump traversal, safe distance maintenance, traffic light recognition, and overtaking stationary vehicles. Prizes of 500 OMR, 300 OMR, and 200 OMR will be awarded to the first, second, and third place winners, respectively, accompanied by distinguished recognition.

These competitions not only provide exceptional opportunities for participants to demonstrate their technical skills but also foster collaboration and camaraderie, resulting in a rewarding and memorable experience for all involved.

3rd International Conference on Unmanned Vehicle Systems

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Abstracts

3rd International Conference on Unmanned Vehicle Systems

Intelligent Systems for Industrial Challenges

Session -1

Session-1:
Date: 10 February 2026 **Time:** 15:40 - 16:00

Experimental Validation of Finite-Time Robust Control for Autonomous Vehicles using QCar

Younes Lahiouel (Canada),
Yassine Kali (Canada),
Maarouf Saad (Canada),
Baptiste Bancel, (Canada),
Jawhar Ghommam (Oman)

The performance of autonomous vehicles in tasks where lateral maneuvers are required can be significantly compromised by uncertainties, parameter variations, and external disturbances. To address these challenges, this work proposes an adaptive super-twisting controller aimed at improving path tracking performance under uncertain conditions. The proposed technique effectively reduces the chattering effect, ensures high tracking accuracy, and offers robustness against disturbances, while guaranteeing finite-time convergence. To validate the effectiveness of the developed technique, initial simulations are conducted using a digital twin model, followed by experimental validation on a 1/10 scale QCar in a real-world driving scenario.

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Session -2

Session-2:
Date: 10 February 2026 **Time:** 14:20 - 14:40

Prescribed Performance Cooperative Design for the UAV-UGV System: Vision-based Guidance Control Approach

Jawhar Ghommam (Oman),
Ibrahim Naimi (Oman),
Saif-sinan Al-Abduljaleel Saif (Canada),
Maarouf Saad (Canada)

This paper addresses the problem of cooperative control design for a UAV-UGV system under prescribed performance constraints and vision-based measurements. The UAV is equipped with a downward-facing camera that provides lineof- sight (LOS) relative position information of the UGV, which serves as the primary shared measurement for synchronization. The coupled UAV-UGV dynamics are modeled with full nonlinearities, external disturbances, and model uncertainties. To guarantee accurate trajectory tracking and inter-vehicle distance regulation, a prescribed performance control (PPC) framework is developed, ensuring that both the UAV's LOS tracking error and the UAV-UGV relative distance error evolve strictly within predefined bounds. A backstepping-based control law is proposed to stabilize the cooperative dynamics while respecting the asymmetric safety constraints. In addition, a prescribed-time shifting function is introduced to eliminate potential singularities arising from adverse initial conditions, thereby ensuring feasibility regardless of the starting state. Stability analysis, based on Lyapunov theory, establishes uniform boundedness of all closed-loop signals. The proposed framework provides a systematic solution for safe, precise, and robust cooperation of UAV-UGV systems, with potential applications in target tracking, autonomous navigation, and ground-aerial coordination tasks.

Session-2:
Date: 10 February 2026 **Time:** 14:40 - 15:00

Resilient Reconfiguration and Fault-Tolerant Cooperative Control of MAS under Permanent Link Failures within a Hybrid-Systems Framework

Estrada Jonathan (France),
Mohamed Djemai (France),
Bernardino Castillo-Toledo (Mixico),
Michael Defoort (France)

This work addresses the problem of fault-tolerant cooperative control (FTCC) in multi-agent systems (MAS) subject to abrupt and randomly occurring link failures. The agent dynamics and consensus algorithm are reformulated as a closed-loop stability problem. A hybrid system framework is adopted to model both the occurrence of link failures and the subsequent network reconfiguration. A topology reconfiguration protocol is proposed to ensure resilient consensus despite these disruptions, eliminating the need for the link recoverability assumption common in intermittent communication scenarios. The effectiveness of the proposed strategy is validated through illustrative simulations, including a 3D formation control problem and a trajectory-oriented structural inspection scenario.

Session-2:
Date: 10 February 2026 **Time:** 15:00 - 15:20

Sustainable Flight Path Optimization for UAVs in Variable Environments

Keerthana Perumal (Oman)

Unmanned Aerial Vehicles (UAVs) are increasingly being employed in a broad range of uses, and are typically susceptible to the operational situations, in which the loss of efficiency is frequently encountered owing to the varying conditions such as wind turbulence, rough terrain features, and constrained airspaces. Energy efficiency, flexibility, and environmental sustainability are critical steps in the direction of making flight operations sustainable. A dynamic, environmental constraint-based, energy-conscious, sustainability-oriented optimization design, which incorporates a battery degradation model and a carbon footprint calculation in the trajectory planning model. The digital twins are tested in the framework with real flight information in cities, coastal, mountainous, and rural conditions. Results depict up to 26.4% energy efficiency, 96.5% mission success, 0.84 sustainability coefficient, and high resilience with smaller path deviation and mission delay compared to existing techniques. The findings support the fact that incorporating sustainability into the UAV flight path optimization enhances their endurance, reliability, and environmental sustainability to facilitate their adoption in smart air mobility systems in the future.

Session-2:
Date: 10 February 2026 **Time:** 15:20 - 15:40

Drone-based Estimation of Chlorophyll-a in Reservoirs: A Cubist-based Ensemble Model

Soheil Ghasemnezhad (Iran),
Mohammad Reza Nikoo (Oman),
Mahmoud Mashal (Iran),
Malik Al-Wardy (Oman)

Water quality monitoring is crucial for optimal reservoir operation and management. chlorophyll-a is a vital water quality parameter, as it plays a key role in the eutrophication of lakes and reservoirs. In this research, drone imagery and machine learning models were used to estimate chlorophyll-a concentrations in the Wadi Dayqah reservoir in Oman. Six bands from the drone's camera were used to evaluate three vegetation indices and two band ratios. The minimum-Redundancy-Maximum-Relevance (mRMR) algorithm was utilized to identify the most influential features for chlorophyll-a estimation. These features include thermal band, blue band, Normalized Difference Red Edge index (NDREi), Green Normalized Difference Vegetation Index (GNDVI), and the blue-to-green ratio. The Lazy Predict library was utilized to fit 42 regression models and to sort them based on their predictive performance. Four of the best-performing models, namely, Extra Trees, LightGBM, NuSVR, and AdaBoost regressors, were selected. After hyperparameter tuning, they achieved a coefficient of determination (R^2) of 0.70,0.68,0.67, and 0.67, respectively. These models were used as base-learners for the ensemble Cubist meta-learner model, which enhanced the R^2 score to 0.82. The results show the effectiveness of coupling Lazy Predict with the Cubist model to improve chlorophyll-a prediction accuracy in reservoirs.

Session-2:
Date: 10 February 2026 **Time:** 15:40 - 16:00

AI-Enabled Unmanned Vehicle Systems for Transforming Healthcare Delivery: Strategic Applications and Roadmap for Oman's Public Health System

Anas Ansari (Taiwan),
Abdullah Ansari (Oman),
Khalifa Al Jabri (Oman),
Jing-Ming Guo (Taiwan),
Abdul Rahman Ansari (India),
H.E. Khodke (India)

This paper explores the transformative potential of AI-enabled Unmanned Vehicle Systems (UVS) in enhancing healthcare logistics within Oman's public health sector, with a specific focus on Unmanned Aerial Vehicles (UAVs) for medical supply delivery. Oman's unique geography, characterized by remote mountainous terrain and limited road access, presents significant challenges for the timely and equitable delivery of healthcare. The proposed system integrates AI-driven autonomous routing and multi-vehicle coordination to optimize the delivery of critical medical supplies, including vaccines, diagnostics, blood products, and emergency medications. Key technical and policy considerations are addressed, such as airspace regulations, data privacy, cybersecurity, and interoperability with health information systems. A five-phase roadmap is presented, outlining a structured strategy for national-level implementation: from governance and pilot deployments to regulatory frameworks, scale-up, and sustainability. By aligning UAV-based healthcare logistics with Oman Vision 2040, this work demonstrates how targeted UVS applications can enhance access, responsiveness, and system resilience in public health, providing a scalable model for other nations facing similar healthcare delivery challenges.

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Session -3

Session-3:
Date: 10 February 2026 **Time:** 12:00 - 12:20

DookFlight: A Drone Simulator Platform for Studying Advanced Controllers

Navid Nasiri (Oman),
Morteza Mohammadzaheri (Oman)

This paper presents DookFlight-Ver1.3, a Pygame-based drone simulator designed for drone control and stability analysis, both for education and professional use. The simulator includes a tunable PID control system to control a drone within a 2D environment. Growing the use of drones in a variety of applications, in recent years, on one hand, and high costs of the real world's experiments on the other hand, underscore the need for such this accessible drone simulators [1]. Existing platforms, while advanced, pose challenges with complicated installation process and their need to a large computer memory due to their excessive high resolution in the visual modeling [2]. In addition, their variety of functions, like animation movie creating, make them too time consuming to learn and use for a drone controller [3]. Therefore, the proposed simulator by concentrating on drone modeling and controlling, intuitive GUI and real-time data logging creates a user-friendly alternative to existing complex tools. DookFlight's accessibility and adaptability contribute significantly to UAV training, with planned enhancements in version 2.0, including swarm drone, heterogenous analysis and hardware integration, poised to broaden its real-world applicability.

Session-3:
Date: 10 February 2026 **Time:** 12:20 - 12:40

Reliability Analysis of Aeronautical Structures: A Stochastic Approach to Periodic Structures

Mohamed Guedri (Tunisia)

Technological advancements in the aeronautics sector, especially with drones (Unmanned Aerial Vehicle), demand more precise design methods. Our work presents an new periodic-reliability approach for modeling periodic structures by combining a stochastic method with reliability analysis techniques. Unlike traditional deterministic models that assume perfect uniformity, our approach treats the structure's base cell as a random variable. By probabilistically repeating this cell, we generate a global structure that incorporates real uncertainties and variations at different spatial scales. The resulting numerical model is then coupled with reliability methods for in-depth analysis. The robustness of this method was validated through rigorous vibration analysis and a case study on a drone's stabilizer, a structure representative of industrial challenges. The results demonstrate that our approach provides a better representation of real behavior, which significantly improves reliability assessment. In practice, the proposed stochastic method predicts reference results from Latin Hypercube Sampling (LHS) with remarkable accuracy. Furthermore, it leads to a drastic reduction in computation time, achieving up to 99.7% savings compared to LHS simulation. In conclusion, this new approach offers a promising outlook for modeling by providing a more realistic and efficient framework for analyzing complex periodic structures.

Session-3:
Date: 10 February 2026 **Time:** 12:40 - 13:00

Practical PID Tuning for Quadcopter Stability: Experimental Results

Aybak Ahmad (Jordan),
Sereen Alzu'bi (Jordan),
Tarek A. Tutunji (Jordan)

This paper presents practical results for the PID tuning of a small-scale quadcopter through a series of flight experiments conducted on the roll, pitch, and yaw axes. Flight data were collected using the Betaflight firmware and Blackbox tool, then analyzed with PIDtoolbox and MATLAB to evaluate key performance metrics, including overshoot, settling time, rise time, and steady-state error. The PID parameters were manually tuned and iteratively optimized to achieve the best dynamic response. The experiments were performed on a First Person View (FPV) quadcopter, and the optimized PID gains resulted in noticeable improvements in flight stability and responsiveness. Experimental results confirm that the tuned parameters significantly reduced overshoot and rise time, demonstrating the effectiveness of manual PID tuning in enhancing quadcopter performance.

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Session -4

Session-4:
Date: 10 February 2026 **Time:** 12:00 - 12:20

Transportation of the future: the idea behind the integration of alternative energy sources and autonomous systems

Agnes Csiszárik-Kocsir (Hungary),
János Varga (Hungary)

The future of transportation is increasingly moving towards the integration of alternative energy sources and autonomous systems, which represents a paradigm shift not only from a technological perspective, but also from a social and economic one. The aim of this research is to explore the underlying ideas and attitudes that determine the acceptance and development of sustainable transport systems in Hungary. The study focuses on issues such as corporate responsibility in the fight against climate change, the perception of nuclear energy as green, and the role of artificial intelligence in reducing pollutant emissions. The results of the research show that there is strong public support for electric-powered means of transport and renewable energy sources, while the perception of nuclear energy is divided, although it is increasingly seen as a strategic element in building a sustainable economy. The majority of respondents consider reducing energy and material consumption and an innovative, sustainability-oriented economic approach to be of paramount importance. The use of artificial intelligence is also viewed positively, especially in terms of efficiency and reducing environmental impact. The study points out that sustainability and green goals are not only environmental factors, but also competitiveness factors that fundamentally influence the future success of a country or business. Based on the results, we make recommendations for integrated green technology solutions that can be applied in the transport sector to help align economic and environmental goals.

Session-4:
Date: 10 February 2026 **Time:** 12:20 - 12:40

Integrated UAV-based Mapping and Cloud-Based System for Digital Twin Creation of Historical Sites: A Case Study of Mutrah Fort

Mohammed Eldiasty (Oman),
Alya Al-Hashim (Oman)

This article presents an effective method for application of Unmanned Aerial Vehicles (UAVs) and cloud computing for Built Cultural Heritage (BCH). The combination of UAV imaging technology used for data acquisition and cloud computing used for data analysis and visualization is an effective method to develop digital twin (DT) models. The UAVs are used to collect high resolution images and aerial data of Heritage sites such as historical landmarks, artifacts, and architectural features, and the data are uploaded to the cloud computing platform, where photogrammetry algorithms produce detailed point cloud and 3D models and maps of the Heritage sites. The virtual reality developers use the 3D models and maps to produce overlaid experiences for the real-world environment captured through the UAV. Then, visitors can access the digital twin models through mobile apps to explore the Heritage site in new and engaging methodology. In order to verify the model, the UAV-based DJI 350 drone system equipped with Zenmuse P1 camera is applied to obtain high-resolution images in Mutrah Fort Heritage site and cloud computing using Pix4Dcloud platform is used to produce detailed point cloud, 3D mesh and DT models using aerial triangulation processing engine. The findings indicate that the use of UAVs and Pix4Dcloud can improve data accuracy and resolution at few centimeters level.

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Intelligent Systems for Industrial Challenges

Session -5

Session-5:
Date: 11 February 2026 **Time:** 14:40 - 15:00

Auto Road Inspector: Road Damage Recognition and Reporting System

Wahaj Hoti (Oman),
Asma Ismail Al Balushi (Oman),
Ruba Said Al Humaidi (Oman),
Ragavesh Dhandapani (Oman)

Quality Road network plays an important role in a country's economic development. Well-maintained road network improves citizens' living conditions and satisfaction. Hence, proper maintenance of the road network is highly essential. The proposed work in this article, 'Auto Road Inspector', is an innovative automated system designed to enhance road maintenance plans. The proposed system effectively detects road damage, such as ditches, potholes, and cracks, using Roboflow Object Detection v3.0, YOLO-NAS and a Convolutional Neural Network (CNN). The proposed work involves collecting high-quality images of various road conditions, followed by preprocessing and categorisation into different road defects. We used the following labels: 'Holes', 'Cracks', and 'Normal', which were labelled in the Roboflow Platform. We also developed a CNN and trained it on a custom dataset of images for damage detection and classification, supplemented by the YOLO-NAS model for its rapid processing and high accuracy. The findings reveal that our method is effective, achieving a mAP of 80.1%. Future work could expand the dataset across regions and different conditions, and implement it in real time.

Session-5:
Date: 11 February 2026 **Time:** 15:00 - 15:20

A Robust Model-Based Corrector Iterative Learning Control for Mecanum Robots: Comparative Analysis of Adaptive Architectures

Nayan Banik (USA),
Jawhar Ghommam (Oman),
Mohammad habibur Rahman (USA)

This paper investigates robustness and convergence of iterative learning control (ILC) for mecanum-wheeled mobile robots operating under plant uncertainty and nonrepetitive disturbances. A Model-Based Corrector (MBC) ILC is introduced, which employs a fixed nominal inverse model to update the control input each iteration, thereby eliminating the need for online parameter estimation. Theoretical analysis based on the lifted-system formulation shows that convergence depends solely on the nominal model's fidelity, ensuring stability under moderate modeling errors. The proposed method is experimentally compared with a baseline P-type ILC and an adaptive parameter-estimation ILC on a leminiscate trajectory tracking task subject to Gaussian measurement noise, a one-time disturbance, and a permanent plant change. Quantitative results demonstrate that MBC-ILC achieves the desired noise-floor accuracy (RMSE approx. 0.02) within a few iterations, rejects nonrepetitive disturbances in a single iteration, and re-converges within six iterations following a plant change. Results show that a fixed-model corrector achieves a strong tradeoff of convergence speed, steady accuracy, and robustness at low computational cost, making it practical control architecture for robust trajectory learning in mobile robots.

Session-5:
Date: 11 February 2026 **Time:** 15:20 - 15:40

Traffic congestion perdition using vehicle trajectories from Drone and combined Graph Attention and Temporal Convolutional Network

Hana Gharrad (France),
Nesrine Ouled Abdallah (Oman)

Congestion prediction is an important and a challenging task in intelligent transportation systems. Such task should effectively capture the spatio-temporal dependencies in road networks because traffic congestion can propagate in the spatial scale over time. With recent computer vision advancement, the use of Unmanned Ariel Vehicles (UAVs) is gaining more attention as tool for traffic data collection. In this work we evaluate the performance of Temporal Convolutional Network per edge versus Temporal Graph Neural Network to predict the congestion ratio of road segment in road network. The modeling of the graph structure was extracted from open vehicle trajectories data recorded using a swarm of drones. Two different models were implemented and compared for the task of congestion prediction per edge aiming to capture the structural correlation between edges, the spatial effect and the temporal pattern of traffic congestion.

Session-5:
Date: 11 February 2026 **Time:** 15:40 - 16:00

Machine Learning-Based Fault Classification for KPCA Digital Twin Model Predictive Control in Autonomous Vehicles

Romdhane Nasri (Tunisia),
Majdi Mansouri (Oman),
Zouhaier Affi (Tunisia),
Vicenç Puig (France)

This paper presents a comprehensive machine learning-based fault classification framework integrated with Kernel Principal Component Analysis (KPCA) Digital Twin Model Predictive Control (MPC) for autonomous vehicle trajectory tracking. The proposed system addresses critical sensor and actuator faults including sensor bias, sensor drift, sensor noise, and actuator degradation through a dual-classifier approach combining Support Vector Machine (SVM) and Neural Network (NN) architectures. The system extracts compact three-dimensional features from vehicle states and applies ensemble voting for robust fault identification. Experimental results on Berkeley L-shape racing track demonstrate classification accuracies exceeding 80\% with the Neural Network achieving superior performance on drift detection. The proposed framework reduces lateral tracking error by 88\% and maintains velocity tracking within acceptable bounds compared to uncompensated fault scenarios. Real-time feasibility is demonstrated with 11.1ms mean computational time at 20ms sampling rate, validating the effectiveness of the ML-based fault-tolerant control approach for autonomous vehicle applications.

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Session -6

Session-6:
Date: 11 February 2026 **Time:** 14:40 - 15:00

YOLO-Powered UAV Imaging for Precise Detection of Fungal Infections in Palm Trees

Omer Eldirdiry (Oman),
Mawadda Khalifa Alwardi (Oman),
Alhasan Hilal Alshekaili (Oman),
Hamza Abdullah Alismaili (Oman),
Alwaleed Aldahmani (Oman)

Early detection of fungal diseases in palm trees is crucial to prevent crop losses. This paper presents an innovative AI-based solution for addressing fungal infections, combining UAV technology with computer vision. Using over 600 images for annotating fungal subjects captured from multiple angles, the YOLO-Medium model was trained to identify infected areas with high accuracy and a confidence level of 91%, even under challenging lighting conditions. The system enables farmers to use UAV technologies to easily, quickly, and precisely monitor plantations and tree issues, providing an effective tool for crop protection and improved farm management. In addition, the integration of UAVs makes this approach highly effective for periodic inspection of palm trees, supporting long-term health monitoring and enabling timely treatment, while also offering a time-efficient solution for large-scale plantation management.

Session-6:
Date: 11 February 2026 **Time:** 15:00 - 15:20

Drone Thermal Cameras System for Accurate Temperature Measurements in Oil Fields Using Al

Salim Almamari (Oman),
Moudafer Alwahibi (Oman),
Abdullah Alshehhi (Oman),
Ahmed Tabook (Oman),
Ahmed Al Maashri (Oman),
Hadj Bourdoucen (Oman)

Drone thermal cameras are key components of the 4th Industrial Revolution, widely used to capture thermal data across both small and large geographic areas. These cameras generate temperature values and thermal maps that help identify hot and cold zones. However, achieving accurate temperature measurements in outdoor environments remains a challenge due to various factors, including environmental temperature, weather conditions, humidity levels, time of the day, camera distance and angle, and the rough surface of the targeted area. By utilizing thermal imaging, drone-based systems can monitor critical assets such as pipelines, storage tanks, and machinery, which are prone to overheating, leaks, and fire hazards. Unlike stationary thermal cameras, drones capture real-time temperature data that is instantly processed and reported, enabling comprehensive, high resolution inspections. The integration of artificial intelligence further improves accuracy and facilitates predictive maintenance, allowing potential issues to be identified and addressed before they lead to equipment failures, costly downtime, or financial losses. Moreover, drones enhance safety by minimizing the need for workers to enter hazardous zones while ensuring efficient data collection, transfer, and analysis. This paper aims to leverage drone thermal cameras, combined with AI tools, to operate effectively in harsh industrial environments and hard-to-reach areas. The goal is to improve the accuracy and reliability of temperature measurements in the oil and gas industry, while also demonstrating applications across other sectors.

Session-6:
Date: 11 February 2026 **Time:** 15:20 - 15:40

Assessment of Drone Imagery for Water Quality Estimation in Wadi Dayqah Reservoir

Sadegh Nehi (Iran),
Mohammad Reza Nikoo (Oman),
Malik Al-Wardy (Oman),
Sadegh Vanda (Iran),
R. Kerachian (Iran),
Navid Nasiri (Oman)

Measuring water quality in deep reservoirs using traditional on-site methods is accurate but often not practical. Thanks to satellite and unmanned aerial vehicles (UAVs), many studies have been done to estimate various water quality variables (WQVs) in water bodies. However, most studies have focused on surface-level estimates, which aren't applicable for deep reservoirs where WQVs change significantly with depth. While previous studies have used remote sensing data for estimating water quality, few have assessed water quality variables at lower levels in deep water bodies. In this study, we used UAV data to estimate the vertical profiles of different water quality variables and assessed combining different data sources to improve the results. Our findings indicate that using UAV data to estimate vertical water quality profiles is possible, and in certain cases, can be enhanced by combining data from multiple sources.

Session-6:
Date: 11 February 2026 **Time:** 15:40 - 16:00

Stable Fault-Tolerant Control for Autonomous Vehicles: Model Predictive Control with Digital Twin Integration

Romdhane Nasri (Tunisia),
Majdi Mansouri (Oman),
Zouhaier Affi (Tunisia),
Vicenç Puig (France)

This paper proposed a stable fault-tolerant Model Predictive Control (MPC) framework that integrates digital twin-based fault reconstruction directly into the control optimization process, ensuring continuous and reliable operation under sensor and actuator faults. By embedding fault predictions within the MPC formulation, the controller achieves proactive fault compensation, while adaptive weighting dynamically balances tracking accuracy and control authority based on fault severity and model confidence. A Lyapunov-based stability analysis provides formal guarantees for closed-loop stability and bounded performance degradation. The proposed framework operates efficiently in real time through hierarchical multi-rate processing, maintaining control cycles below 20~ms. Experimental results demonstrate substantial improvements in performance, with 90.5\% reduction in velocity error, 91.7\% reduction in lateral position error, and 81.1\% reduction in angular error, establishing a robust benchmark for safe and resilient autonomous vehicle control.

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