Conference Agenda

Session Overview

Date: Wednesday, 10/Sept/2025

8:00am - 8:45am	**Registration - Day 1**
8:45am - 9:00am	**Opening Ceremony** Location: **Kaleva**

9:00am - 9:30am	**Key1: Keynote: Prof. Fu Zhang University of Hong Kong, Hong Kong S.A.R. (China)** Location: **Kaleva**

ID: 193 / Key1: 1
Keynote

A LiDAR-centric approach for reliable UAV navigation

Fu Zhang
University of Hong Kong, Hong Kong S.A.R. (China)

9:30am - 10:30am	**Technical Program - UAVG1: Cutting-Edge UAV Robotics: Navigation, Mapping, and Autonomy 1** Location: **Kaleva**

9:30am - 9:45am
ID: 155 / Technical Program - UAVG1: 1
ISPRS Annals Submission
Keywords: UAV, Multi-sensor fusion SLAM, Nadir view, State estimation, Factor graph

Multi-sensor Fusion SLAM from the Nadir View for UAV Localization and Mapping

Yawen Li, George Vosselman, Francesco Nex
Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, Enschede, The Netherlands

9:45am - 10:00am
ID: 142 / Technical Program - UAVG1: 2
ISPRS Annals Submission
Keywords: Adverse weather, lidar odometry, localization, mapping, denoising

Fast Point Ranking - Robust Cloud Voxelization and Denoising for Lidar Odometry and Mapping in Adverse Weather Conditions

Eugeniu Vezeteu[1], **Heikki Hyyti**[1], **Ville Kyrki**[2], **Juha Hyyppä**[1]
[1]Finnish Geospatial Research Institute, Finland; [2]Aalto University, Finland

10:00am - 10:15am
ID: 123 / Technical Program - UAVG1: 3
ISPRS Archives Submission
Keywords: Autonomous flying, Forest, Lidar, Path planning, Simultaneous localization and mapping

Evaluating the performance of a lidar-based autonomous flying system for flying inside forest

Aleksi Viljami Karhunen, Teemu Hakala, Väinö Karjalainen, Eija Honkavaara
Finnish Geospatial Research Institute, Finland

10:15am - 10:30am
ID: 140 / Technical Program - UAVG1: 4
ISPRS Annals Submission
Keywords: Extrinsic calibration, Thermal camera, LIDAR, UGV, UXV, Mapping

Low-cost Extrinsic Calibration Between LIDAR and Thermal Camera for Indoor Mapping

Benjamin Ronald van Manen[1,2], **Ville Lehtola**[2], **Abeje Yenehun Mersha**[1], **Francesco Nex**[2]
[1]Academy of Life Science, Engineering And Design, Saxion University of Applied Sciences, Enschede, The Netherlands; [2]Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, Enschede, The Netherlands

10:30am - 11:00am	**Coffee Break - Day 1** Location: **Kaleva Hall**
11:00am - 11:30am	**Key2: Keynote: Prof. Pablo J. Zarco-Tejada Spanish Council for Scientific Research (CSIC), Spain** Location: **Kaleva**

ID: 192 / Key2: 1
Keynote

Physiological assessment of vegetation using airborne platforms: 25 years of progress in hyperspectral methods

Pablo J. Zarco-Tejada
Spanish Council for Scientific Research (CSIC), Spain

11:30am - 12:30pm	**Technical Program - UAVG2: Intelligent UAVs for Forests and Agriculture 1** Location: **Kaleva**

Session Chair: **Raquel Alves de Oliveira**
Session Chair: **Georg Bareth**

11:30am - 11:45am
ID: 129 / Technical Program - UAVG2: 1
ISPRS Archives Submission
Keywords: European spruce bark beetle, Ips typographus, forest damage, forest disturbance

Hyperspectral drone images indicate that green shoulder indices are robust in pre-emergence detection of spruce bark beetle infestation across spatial and temporal scales

Luiz Henrique Elias Cosimo, Eva Lindberg, Henrik Persson, Jonas Bohlin, Langning Huo
Swedish University of Agricultural Sciences, Sweden

11:45am - 12:00pm
ID: 151 / Technical Program - UAVG2: 2
ISPRS Archives Submission
Keywords: SWIR, crop height, biomass, moisture, nitrogen uptake, nitrogen concentration

Deriving structural and biochemical crop traits from one UAV sensor: Investigating a multiband VNIR/SWIR imaging system for crop trait monitoring

Alexander Jenal[1,2], Andreas Bolten[1], Hubert Hüging[3], Jens Bongartz[2], Georg Bareth[1]

[1]GIS & RS Group, Institute of Geography, University of Cologne, Germany; [2]AMLS – Application Centre for Machine Learning and Sensor Technologies, University of Applied Sciences Koblenz, Remagen; [3]INRES – Crop Sciences, Bonn University, Germany

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12:00pm - 12:15pm
ID: 162 / Technical Program - UAVG2: 3
ISPRS Annals Submission
Keywords: UAV, Forest, Orthomosaic, 3D-model, Tree mapping.

Mapping individual spruces with multispectral drone

Jere Johannes Kaivosoja, Samuli Launiainen
Natural Resources Institute Finland, Finland

12:15pm - 12:30pm
ID: 174 / Technical Program - UAVG2: 4
ISPRS Archives Submission
Keywords: UAV, airplane, hyperspectral, thermal, Norway spruce, bark beetle.

Differentiating Acute and Chronic Stress in Norway Spruce Using Hyperspectral and Thermal Remote Sensing in Experimental Plots.

Rastislav Jakus[1], Miroslav Blazenec[1], Matus Pivovar[1], Jana Maresova[1], Vivek Singh[1,2], Aleksandr Karpov[2], Natalie Korolyova[1,3]

[1]Institute of Forest Ecology, Slovak Academy of Sciences, Slovak Republic; [2]Faculty of Forestry and Wood Technology, Czech University of Live Sciences in Prague, Czech Republic; [3]Global Change Research Institute CAS, Brno, Czech Republic

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12:30pm - 1:30pm	**Lunch - Day 1** Location: **Kaleva Hall**

1:30pm - 3:30pm

Coffee and Posters - Day 1; POS1: Poster session and Industrial exhibition
Location: **Kaleva Hall**

ID: 163 / Coffee and Posters - Day 1; POS1: 1
ISPRS Archives Submission
Keywords: Multispectral Imaging, LiDAR Intensity, Sustainable Forest Management, Precision Forestry, UAV-Based Monitoring.

Detecting Root Rot Infected Norway Spruce Trees Using Multispectral and LiDAR UAV Data

Gustav Boman, Basam Dahy, Esra Sengun, Johanna Witzell, Johan E.S. Fransson
Department of Forestry and Wood Technology, Linnaeus University, Sweden

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ID: 173 / Coffee and Posters - Day 1; POS1: 2
ISPRS Archives Submission
Keywords: machine learning, UAV, chlorophyll-a, turbidity, water quality, eutrophic reservoir

Chlorophyll-a and Turbidity estimation using UAV imagery and machine learning in a tropical eutrophic reservoir

Daniel H. C. Salim[1], Caio C. S. Mello[1], Gabriel Pereira[2], Raian V. Maretto[3], Frederico S. Machado[4], Camila C. Amorim[1]

[1]Universidade Federal de Minas Gerais, Brazil; [2]Universidade Federal de São João del-Rei, Brazil; [3]University of Twente, the Netherlands4; [4]Petrobras Research Center, Brazil

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ID: 158 / Coffee and Posters - Day 1; POS1: 3
ISPRS Archives Submission
Keywords: Bark beetle, Tree health classification, Deep learning, UAV, Multiview images

A Multiview UAV Imagery-Based Method for Assessing Spruce Tree Health at the Individual Tree Level

Alva Selina Anttonen, Axel Päivänsalo, Emma Turkulainen, Raquel Alves de Oliveira, Kirsi Karila, Niko Koivumäki, Roope Näsi, Eija Honkavaara
Finnish Geospatial Research Institute (FGI), Finland

ID: 127 / Coffee and Posters - Day 1; POS1: 4
ISPRS Archives Submission
Keywords: crop residue, tillage, UAV, aerial imaging, multispectral imaging

Determining the Amount of Crop Residue Cover Using Image Analysis

<u>Mikael Aleksi Änäkkälä</u>, Roope Rantanen, Antti Lajunen

University of Helsinki, Finland

ID: 133 / Coffee and Posters - Day 1; POS1: 5
ISPRS Archives Submission
Keywords: UAV, crop, height, biomass, nitrogen uptake, nitrogen concentration

Applying UAV-based crop height to monitor biomass, N-concentration, and N-uptake in winter wheat

Georg Bareth[1], Christoph Hütt[1], Alexander Jenal[1,2], Andreas Bolten[1], Nora Tilly[1], Hubert Hüging[3]

[1]GIS & RS Group, Institute of Geography, University of Cologne, Germany; [2]AMLS – Application Centre for Machine Learning and Sensor Technologies, University of Applied Sciences Koblenz, Remagen; [3]INRES – Crop Sciences, Bonn University, Germany

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ID: 166 / Coffee and Posters - Day 1; POS1: 6
ISPRS Archives Submission
Keywords: Precision Forestry, Sustainable Forest Management, UAV-based Monitoring, Forest Monitoring.

Mapping Boreal Forest Vitality Using Drone-Based Multispectral Time-Series and Object-Based Classification

<u>Basam Dahy</u>, Esra Sengun, Johanna Witzell, Johan E.S. Fransson

Department of Forestry and Wood Technology, Linnaeus University, Sweden

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ID: 183 / Coffee and Posters - Day 1; POS1: 7
ISPRS Archives Submission
Keywords: Multispectral, Unmanned Aerial System (UAS), Grass Biomass, Machine Learning

Evaluation of forage grass biomass estimation models using multispectral drone imaging across multiple sites

<u>Raquel Alves de Oliveira</u>[1], Roope Näsi[1], Jonas Edström[1,3], Joel Pitkänen[1,4], Panu Korhonen[2], Oiva Niemeläinen[2], Niko Koivumäki[1], Jere Kaivosoja[2], Eija Honkavaara[1]

[1]FInnish Geospatial Research Institute in National Land Survey of Finland, Finland; [2]Natural Resources Institute Finland; [3]UPM Energy, Helsinki, Finland; [4]Aiforia Technologies Plc, Helsinki, Finland

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ID: 115 / Coffee and Posters - Day 1; POS1: 8
ISPRS Archives Submission
Keywords: MOTS, Precision Agriculture, UAV, RGB imagery, Woody Crops

UAV-assisted Multi-Object Tracking and Segmentation of Apples under Occlusions in Orchard

<u>Kaiwen Wang</u>[1], Lammert Kooistra[2], Wensheng Wang[3], João Valente[4]

[1]Information Technology Group, Wageningen University & Research, Netherlands; [2]Laboratory of Geo-Information Science and Remote Sensing, Wageningen University & Research, Netherlands; [3]Agricultural Information Institute, Chinese Academy of Agriculture Sciences, Beijing, China; [4]Centre for Automation and Robotics (CAR), National Research Council (CSIC), Madrid, Spain

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ID: 146 / Coffee and Posters - Day 1; POS1: 9
ISPRS Archives Submission
Keywords: Forest, NDVI, Canopy Openness, Radiometric Quality Assessment

Remote Sensing Upside Down: Exploring the Potential of Ground-Based Multispectral Cameras for Tree Crown Monitoring

Mona Goebel, Lukas Wolf, Federik Packwitz, Dorota Iwaszczuk

Technical University of Darmstadt, Remote Sensing and Image Analsysis, Germany

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ID: 152 / Coffee and Posters - Day 1; POS1: 10
ISPRS Archives Submission
Keywords: Climate change, monitoring, UAV, vegetation classification, bathymetry

UAV and AI for large-scale monitoring of the effects of climate change on mountain lake areas: the ACLIMO cross-border cooperation project

<u>Chiara Graziani</u>, Andrea Maria Lingua, Francesca Matrone, Alessandra Spadaro

Politecnico di Torino, Italy

ID: 105 / Coffee and Posters - Day 1; POS1: 11
ISPRS Archives Submission
Keywords: UAV environment monitoring, Structure-from-motion, Multi-view stereo, 3D debris detection, Volume estimation

Marine Debris Monitoring on Uninhabited Islands Using UAV-Based 3D Modeling

<u>Sung-Joo Yoon</u>, Tae-Ho Kim

Underwater Survey Technology 21, Korea, Republic of (South Korea)

ID: 116 / Coffee and Posters - Day 1; POS1: 12
ISPRS Annals Submission
Keywords: emergent aquatic vegetation (EAV), "homogeneous" regions in high resolution images, Object based image analysis (OBIA), High spatial resolution imagery

Assessment of smoothing and scale change effects on aquatic emergent vegetation in high spatial resolution image segmentation

Leticia Mayumi Matsuda, Nilton Nobuhiro Imai, Adilson Berveglieri
State University of Sao Paulo - Unesp, Brazil

3:30pm - 5:00pm

Technical Program - UAVG3: Intelligent UAVs for Forests and Agriculture 2

Location: **Kaleva**
Session Chair: **Lammert Kooistra**
Session Chair: **Langning Huo**

3:30pm - 3:45pm
ID: 167 / Technical Program - UAVG3: 1
ISPRS Archives Submission
Keywords: Precision agriculture, AgriTech, Computer Vision, Object Detection, Photogrammetry, UAS

Integrating UAS, Computer Vision and AI for Targeted Management of Invasive Insect Pests in Vineyards

Andrea Maria Lingua[1], Alessio Martino[2], Francesca Gallitto[1], Stefania Manca[1], Paolo Maschio[1], Valeria Longhi[3], Filiberto Chiabrando[2], Marco Grella[4]

[1]Politecnico di Torino, DIATI, Italy; [2]Politecnico di Torino, DAD, Italy; [3]Politecnico di Torino, DIST, Italy; [4]Università di Torino, DIFASA, Italy

3:45pm - 4:00pm
ID: 184 / Technical Program - UAVG3: 2
ISPRS Archives Submission
Keywords: UAV, remote sensing, photogrammetry, agriculture, plant classification, deep learning, oat, clustering, multi-view

Optimizing high-resolution multi-view drone imaging for detecting foreign grains in gluten-free oat production fields

Roope Näsi[1], Raquel Alves de Oliveira[1], Stefan Rua[1], Ehsan Khoramshahi[3], Axel Päivänsalo[1], Oiva Niemeläinen[2], Eija Honkavaara[1], Markku Niskanen[2]

[1]Finnish Geospatial Research Institute FGI in National Land Survey of Finland, Finland; [2]Natural Resources Institute Finland (Luke), Finland; [3]Dept. of Geographical and Historical Studies, Faculty of Social Sciences and Business Studies, University of Eastern Finland

4:00pm - 4:15pm
ID: 169 / Technical Program - UAVG3: 3
ISPRS Annals Submission
Keywords: Deep Learning (DL), Tree Detection, LiDAR, Artificial Intelligence (AI), Precision Forestry, YOLO.

Comparative Analysis of YOLOv8 and YOLOv11 on Tree Detection Using UAV RGB and Laser Scanning Data

Esra Sengun[1], Samet Aksoy[2], Elif Sertel[2], Johan E.S. Fransson[1]

[1]Department of Forestry and Wood Technology, Linnaeus University, Sweden; [2]Department of Geomatics Engineering, Istanbul Technical University, Turkey

4:15pm - 4:30pm
ID: 150 / Technical Program - UAVG3: 4
ISPRS Archives Submission
Keywords: Individual Tree Detection, Vegetation Classification, UAV, Multispectral data, Mediterranean Ecosystem

Individual Tree Species Classification in a Mediterranean Ecosystem using UAV-Acquired Multispectral Images and Machine Learning

Alessandra Spadaro[1], Andrea Maria Lingua[1], Filiberto Chiabrando[2]

[1]Geomatics Lab, Department of Environment, Land and Infrastructure Engineering (DIATI), Politecnico di Torino, Corso Duca degli Abruzzi, 24, Torino (TO), Italy; [2]Laboratory of Geomatics for Cultural Heritage (LabG4CH), Department of Architecture and Design (DAD), Politecnico di Torino, Viale Pier Andrea Mattioli, 39, Torino (TO), Italy

4:30pm - 4:45pm
ID: 179 / Technical Program - UAVG3: 5
ISPRS Annals Submission
Keywords: Stem characterization, Photogrammetry, Structure from Motion, Diameter estimation, Unmanned aerial vehicle

Tree stem diameter estimation using inexpensive UAV photogrammetric data and Monte Carlo methods

Borja García-Pascual[1,2], Carlos Martín-Cortés[3], Xin Zhou[1], Evgeny Lopatin[4], Mauricio Acuna[2], Kalle Kärhä[1]

[1]School of Forest Sciences, University of Eastern Finland, 80101 Joensuu, Finland; [2]Forest technology and wood material solutions, Natural Resources Institute Finland (Luke), 80100 Joensuu, Finland; [3]Joint Research Unit (JRU) CTFC - AGROTECNIO, 25280 Solsona, Spain; [4]Bioeconomy policies and markets, Natural Resources Institute Finland (Luke), 80100 Joensuu, Finland

4:45pm - 5:00pm
ID: 159 / Technical Program - UAVG3: 6
ISPRS Archives Submission
Keywords: Point cloud, LiDAR, Tree detection, Digital agriculture, Citrus orchard

Assessment of tree detection and segmentation pipelines using Terrestrial Laser Scanning data in orange orchards

Letícia Ferrari Castanheiro[1,2], Mariana Batista Campos[3], Matheus Ferreira Silva[2], Rahuan Miguel Silva[2], Renato César Santos[2], Mauricio Galo[2], Antonio Maria Garcia Tommaselli[2]

[1]Embrapa Digital Agriculture, Campinas, São Paulo, Brazil; [2]Department of Cartography, São Paulo State University (UNESP), School of Technology and Science, campus Presidente Prudente, São Paulo, Brazil; [3]Department of Remote Sensing and Photogrammetry, Finnish Geospatial Research Institute, National Land Survey of Finland, 02150 Espoo, Finland

6:00pm	**Ice Breaker**

Date: Thursday, 11/Sept/2025

8:00am - 9:00am	**Registration - Day 2**

9:00am - 9:30am

Key3: Keynote: Prof. Antonios Tsourdos Cranfield University, United Kingdom
Location: **Kaleva**

ID: 194 / Key3: 1
Keynote

Autonomous BVLOS UAV Operations: From Research to Large-Scale Real-World Deployment

Antonios Tsourdos
Cranfield University, United Kingdom

9:30am - 10:30am

Technical Program - UAVG4: Towards Safe and Scalable Wide-Area BVLOS Operations
Location: **Kaleva**
Session Chair: **Eija Honkavaara**
Session Chair: **Hannu Karvonen**

9:30am - 9:45am
ID: 196 / Technical Program - UAVG4: 1
Keynote

Hydrogen-Powered Autonomy: Scaling BVLOS UAV Operations in Practice

Kelluu Oy
Kelluu Oy, Finland

9:45am - 10:00am
ID: 124 / Technical Program - UAVG4: 2
ISPRS Archives Submission
Keywords: Swarm Intelligence, Systems Thinking, Swarm Robotics, Drone Swarms

Swarm Intelligence and Systems Thinking: Finding Common Ground for the Engineering of Drone Swarms Solutions

Hannu Karvonen[1], Marjoriikka Ylisiurua[1], Arto Wallin[1], Fabrice Saffre[1], Hanno Hildmann[2,3], Vadim Kramar[1], Sebastian Coffeng[1]

[1]VTT Technical Research Centre of Finland Ltd., Finland; [2]Netherlands Organisation for Applied Scientific Research; [3]The Hague University of Applied Sciences

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10:00am - 10:15am
ID: 185 / Technical Program - UAVG4: 3
ISPRS Archives Submission
Keywords: Emergence, behaviors, complex systems, policies, policy analysis, system analysis, robotic systems, swarms

How the engineering of Swarming Behaviors could be drawing on Social Sciences

Hanno Hildmann[1,2], Regina Nockerts[3], Sebastian Coffeng[4], Hannu Karvonen[4], Johan van der Heuvel[1], Ricardo van der Pluijm[5], Fabrice Saffre[4]

[1]TNO Netherlands Organization for Applied Scientific Research; [2]THUAS The Hague University of Applied Sciences; [3]UvA University of Amsterdam; [4]VTT Technical Research Centre of Finland; [5]Royal Netherlands Aerospace Centre (NLR)

10:15am - 10:30am
ID: 136 / Technical Program - UAVG4: 4
ISPRS Archives Submission
Keywords: Urban Air Mobility, Urban Planning, Decision Support System, Usefulness, Planning Support System

A Collaborative GIS for Planning of Urban Drone Launch and Landing Site Locations

Miloš Mladenović[1], Atiullah Saif[1], Eija Honkavaara[2], Pyry Kettunen[2], Mikko Rönneberg[2], Anssi Jussila[2], Leo Niemi[2], Miia Farstad[2]

[1]Aalto University, Finland; [2]Finnish Geospatial Research Institute (FGI) in the National Land Survey of Finland (NLS)

10:30am - 11:00am	**Coffee Break - Day 2** Location: **Kaleva Hall**

11:00am - 12:30pm

Technical Program - UAVG5: Drone Applications in the Built Environment
Location: **Kaleva**
Session Chair: **Taejung Kim**
Session Chair: **Görres Grenzdörffer**

11:00am - 11:15am
ID: 122 / Technical Program - UAVG5: 1
ISPRS Annals Submission
Keywords: Drones, nocturnal light pollution, light control points, Mavic 3 E

Drone based analysis of nocturnal light pollution

Görres Grenzdörffer
Universität Rostock, Germany

11:15am - 11:30am
ID: 161 / Technical Program - UAVG5: 2

ISPRS Annals Submission
Keywords: Infrastructure Inspection, Infrared Thermography, Snow Depth, Uncrewed Aerial Vehicles, Photogrammetry

Cold Region Building Inspection using UAV-based Three-dimensional Reconstruction

Nicholas Chodura[1,2], Derek Boase[1,3], Joshua Woods[1,2], Melissa Greeff[1,3]

[1]Ingenuity Labs Research Institute, Queen's University, Canada; [2]Department of Civil Engineering, Queen's University, Canada; [3]Department of Electrical and Computer Engineering, Queen's University, Canada

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11:30am - 11:45am
ID: 177 / Technical Program - UAVG5: 3
ISPRS Annals Submission
Keywords: waste materials, UAV, thermal images, multispectral images, SCP.

IDENTIFICATION OF WASTE MATERIALS IN SEMI-CONTROLLED TEST SITE USING UAV THERMAL AND MULTISPECTRAL IMAGES

Hassan Ali Makkawi Gassim, Vincenzo Di Pietra, Marco Piras

Politecnico di Torino - Department of Environment, Land and Infrastructure Engineering, Italy

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11:45am - 12:00pm
ID: 108 / Technical Program - UAVG5: 4
ISPRS Archives Submission
Keywords: UAV, Small bridge, Facade Orthomosaic, Crack segmentation, Super-resolution

Exploring the Potential of Super-Resolution for Crack Analysis in UAV Facade Orthomosaics of Small Bridges

Dahye Jang[1], Hyunsoo Park[1], Euiik Jeon[1,2]

[1]AI team, Innopam Co., Ltd., Yongsan-gu, Seoul, South Korea; [2]Department of Urban Big Data Convergence, University of Seoul, Dongdaemoon-gu, Seoul, South Korea

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12:00pm - 12:15pm
ID: 119 / Technical Program - UAVG5: 5
ISPRS Archives Submission
Keywords: Autonomous Exploration, UAV, Crisis and Disaster Management, Mapping

ResQDrone: Autonomous Indoor Quadcopter for Multi-Layered Mapping in Crisis and Disaster Management Scenarios

Marco Cella, Jürgen Biber, Pierrick Bournez, Jules Salzinger, Verena Widhalm, Francesco d'Apolito, Felix Bruckmüller, Christoph Sulzbachner, Phillipp Fanta-Jende
Austrian Institute of Technology, Austria

12:30pm - 1:30pm	**Lunch - Day 2** Location: **Kaleva Hall**
1:30pm - 2:00pm	**Industry keynote: CTO Arttu Soininen, Terrasolid Oy, Breaklines and Mass Points** Location: **Kaleva**
1:30pm - 3:30pm	**Coffee and Posters - Day 2** Location: **Kaleva Hall**

ID: 137 / Coffee and Posters - Day 2: 1
ISPRS Archives Submission
Keywords: UAV, Multi-modal Navigation, Advanced Air Mobility, unified map representation, sensor calibration

Addressing GNSS Vulnerabilities in AAM: A Multi-Modal UAV Testbed for Redundant and Reliable Navigation

Felix Rocco Matzke[1], Tushar Jayesh Barot[2], Shreeja Sridharan[3], Nikolaus Ammann[4], Christoph Kessler[4], Hans-Gerd Maas[1], Frank H. P. Fitzek[3], Anette Eltner[1]

[1]Institute of Photogrammetry and Remote Sensing, Dresden University of Technology, Germany; [2]Institute of Logistics and Aviation, Dresden University of Technology, Germany; [3]Deutsche Telekom Chair of Communication Networks, Dresden University of Technology, Germany; [4]Institute of Flight Systems, German Aerospace Center (DLR)

ID: 191 / Coffee and Posters - Day 2: 2
ISPRS Archives Submission
Keywords: Under-canopy, UAV, Forest Inventory

Under-canopy UAV Solutions for Forest Inventory – Challenges and Opportunities

Xinlian Liang, Guangzu Liu, Xintong Dou
Wuhan University, China, People's Republic of

ID: 130 / Coffee and Posters - Day 2: 3
ISPRS Archives Submission
Keywords: Autonomous navigation, deep learning, UAV, forest environments, obstacle avoidance, trajectory planning

Autonomous Drone Navigation in Forest Environments Using Deep Learning

Guglielmo Del Col, Väinö Karjalainen, Teemu Hakala, Eija Honkavaara
National Land Survey of Finland, Finland

ID: 168 / Coffee and Posters - Day 2: 4
ISPRS Archives Submission
Keywords: Drone, image orientation, camera calibration, GNSS, multispectral

Precise georeferencing of RGB and multispectral drone images without ground control points

José Gonçalves[1,2], Ana Bio[2], Manuel Meyer[1,2]

[1]University of Porto, Science Faculty, Portugal; [2]CIIMAR - Interdisciplinary Centre of Marine and Environmental Research

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ID: 171 / Coffee and Posters - Day 2: 5
ISPRS Archives Submission
Keywords: Under-canopy UAV, LiDAR, Path planning, DBH estimation, Forest inventory

Under-Canopy UAV Global Path Planning for Tree DBH Estimation Using LiDAR

Yang Chen, Shuhang Zhang, Qian Sun, Hao Xiong, Wuming Zhang

Sun Yat-sen University, China, People's Republic of

ID: 117 / Coffee and Posters - Day 2: 6
ISPRS Archives Submission
Keywords: UAS, bridge inspection, flight path planning, infrastructure monitoring, photogrammetry

ORBIT: Optimized Routing for Bridge Inspection Toolkit. An open-source UAS flight path planning tool for comprehensive bridge inspections under realistic constraints

Erkki Tobias Bartczak, Maarten Bassier, Maarten Vergauwen

KU Leuven, Belgium

ID: 128 / Coffee and Posters - Day 2: 7
ISPRS Archives Submission
Keywords: Planar surface areas, voxel, photogrammetry, UAV, 3D point cloud

On Voxel-Based Sampling of Planar Surface Areas from Photogrammetric UAV Data

Petri Rönnholm, Matti T. Vaaja

Aalto University, Finland

ID: 135 / Coffee and Posters - Day 2: 8
ISPRS Archives Submission
Keywords: UAV Photogrammetry, Cadastral Mapping, Segment Anything Model (SAM), Iterative Closest Point (ICP), Land Parcel Adjustment, Orthophoto Segmentation, Spatial Data Quality, AI in Geomatics

An Automated Framework for Cadastral Parcel Adjustment Using UAV Orthophotos, SAM, and ICP

Deni Suwardhi, Muhammad Ihsan, Ratri Widyastuti, Nabila Sofia Eryan Putri, Sella Lestari Nurmaulia, Andri Hernandi

Spatial System and Cadastre Research Group, Faculty of Earth Science and Engineering, Institute of Technology Bandung

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ID: 149 / Coffee and Posters - Day 2: 9
ISPRS Archives Submission
Keywords: UAS Photogrammetry, Geomatics, Cultural Heritage, Teaching Activities, Learning by Doing

UAS for Landscape and Architectural Survey: An Innovative Interdisciplinary Approach of Learning by Doing in the Bachelor Programs at Politecnico di Torino

Alessio Martino[1], Filiberto Chiabrando[1], Andrea Maria Lingua[2]

[1]DAD, Department of Architecture and Design, Politecnico di Torino, 10125 Torino, Italy; [2]DIATI, Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino, 10129 Torino, Italy

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ID: 157 / Coffee and Posters - Day 2: 10
ISPRS Archives Submission
Keywords: Inverted slider crank mechanism, Wildfire suppression, Firefighting drones, Drone swarm in wildfire, Fire-ball dropping

Bimodal MorphoCopter for Wildfire Suppression: Transforming Quadcopters to All-Terrain-Vehicles (ATV)

Osman ACAR[1], Eija HONKAVAARA[2], Selahattin SEFACI[3]

[1]Selcuk University, Turkiye; [2]Finnish Geospatial Research Institute, Finland; [3]Sempa Pompa Makine A.Ş.

ID: 187 / Coffee and Posters - Day 2: 11
ISPRS Archives Submission
Keywords: Uncrewed Aerial Vehicles (UAVs), Solar Farms inspection, Earth Observation, Geo EDGE-AI, RF-DETR, YOLO 12

Real time solar panels heat point's detection with EDGE ViTs using thermal drone imagery

Mouad Jabrane, Imane Sebari, Kenza Ait El Kadi

Research Unit of Geospatial Technologies for a Smart Decision, IAV Hassan II, Rabat 10101, Morocco

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ID: 110 / Coffee and Posters - Day 2: 12
ISPRS Annals Submission
Keywords: dron, waste, invasive species, thermal regime, modelling, apparent temperature

Application of UAV orthophoto and thermal imaging for municipal solid waste landfills monitoring

Olga Brovkina, Lukáš Fajmon, Miroslav Pikl, František Zemek

Global Change Research Institute CAS, Czech Republic

3:30pm - 5:00pm	**Technical Program - UAVG6: Novel UAV Computer Vision Systems and Algorithms** Location: **Kaleva** Session Chair: **Dorota Iwaszczuk** Session Chair: **Antonio Maria Garcia Tommaselli**

ID: 176 / Technical Program - UAVG6: 1
ISPRS Annals Submission
Keywords: Real-Time Bundle Adjustment, Local Bundle Adjustment, Rapid Aerial Mapping, High-Resolution Imagery, Direct Georeferencing

Real-Time Bundle Adjustment for Ultra-High-Resolution UAV Imagery Using Adaptive Patch-Based Feature Tracking

<u>Selim Ahmet Iz</u>[1,2], Francesco Nex[2], Norman Kerle[2], Henry Meissner[1], Ralf Berger[1]

[1]DLR, Germany; [2]University of Twente, The Netherlands

ID: 138 / Technical Program - UAVG6: 2
ISPRS Annals Submission
Keywords: Orthomosaicing, Georeferencing, Small Scale UAVs, Aerial Imaging, UAV Mapping

A Robust Integrated Approach for Near Real-Time Seamless Orthomosaic Generation Using Off-the-Shelf UAVs for Ultra-High Resolution Mapping Applications

<u>Muhammad Farhan Humayun</u>, Ali Salmasi, Jiaqiang Zhang, Tomi Westerlund, Jukka Heikkonen
University of Turku, Finland

ID: 141 / Technical Program - UAVG6: 3
ISPRS Archives Submission
Keywords: Lightglue, Image Mosaic, Feature Matching, Bundle Adjustment, UAV Image

Robust UAV Image Mosaicking Using SIFT and LightGlue

Sung Hyeon Kim[1], <u>Taejung Kim</u>[2]

[1]Dept. of Smart City Engineering, Inha University, Republic of Korea; [2]Dept. of Geoinformatic Engineering, Inha University, Republic of Korea

ID: 120 / Technical Program - UAVG6: 4
ISPRS Annals Submission
Keywords: Unmanned Aerial Vehicles, Pushbroom Sensor, Airborne Imaging Spectrometer, Bayesian Modeling

Distortion Invariant Optical Calibration for Lightweight Airborne Imaging Spectrometry

Julien Burkhard, Jesse Lahaye, <u>Laurent Valentin Jospin</u>, Jan Skaloud
École polytechnique fédérale de Lausanne, Switzerland

ID: 131 / Technical Program - UAVG6: 5
ISPRS Annals Submission
Keywords: UAV, Laserscanning, Trajectory Estimation, Factor Graph, Robotic Total Station

Systematic Error Reduction in UAV-Based Laser Scanning by Using RTS

<u>André Cornelißen</u>, Ansgar Dreier, Felix Esser, Gereon Tombrink, Lasse Klingbeil, Heiner Kuhlmann
University of Bonn, Germany

ID: 118 / Technical Program - UAVG6: 6
ISPRS Archives Submission
Keywords: Static calibration, Lightweight Laser Scanning System, UAV, boresight misalignment.

Misalignment estimation of a lightweight laser scanning system with static calibration

Marcela Vale Machado[1], <u>Antonio Maria Garcia Tommaselli</u>[1], Letícia Ferrari Castanheiro[1], Thaisa Aline Correia Garcia[1], Thiago Tiedtke Reis[2]

[1]São Paulo State Universtiy - Unesp, Brazil; [2]T2R Technological Solutions

7:00pm	**Conference Dinner**

8:00am - 9:00am	**Registration - Day 3**

9:00am - 9:30am	**Key4: Keynote: Prof. Vincent Lepetit ENPC, France** Location: **Kaleva** **ID: 195** / Key4: 1 Keynote **Beyond the Next-Best-View: Machine Learning and Computer Vision for the Exploration and 3D Mapping of Large Scenes** **Vincent Lepetit** ENPC, France

9:30am - 10:30am	**Technical Program - UAVG7: Cutting-Edge UAV Robotics: Navigation, Mapping, and Autonomy 2** Location: **Kaleva** Session Chair: **Francesco Nex** Session Chair: **Antero Kukko** **9:30am - 9:45am** **ID: 160** / Technical Program - UAVG7: 1 ISPRS Annals Submission *Keywords:* NBV, Autonomous, MACARONS, 3D Reconstruction, Self-supervision **Autonomous UAV 3D Reconstruction using Prediction-Based Next Best View** Ziwen Wang, Bashar Alasdik, Francesco Nex University of Twente,ITC Faculty, Netherlands **9:45am - 10:00am** **ID: 111** / Technical Program - UAVG7: 2 ISPRS Archives Submission *Keywords:* object detection, Deep Learning, geo-localization, onboard processing, Fluorescence Intensity Ratio (FIR) **Combining soft robotics and active-laser induced fluorescence for environmental monitoring: Evaluating the drone-scenario of the I-Seed project** **Lammert Kooistra[1], Hasib Mustafa[2], Domantas Girzidas[3], Chenglong Zhang[1], Berry Onderstal[1], Harm Bartholomeus[1]** [1]Wageningen University, Netherlands, The; [2]Twente University, Netherlands, The; [3]Wageningen Research, Netherlands, The **10:00am - 10:15am** **ID: 180** / Technical Program - UAVG7: 3 ISPRS Annals Submission *Keywords:* Visual-Inertial Odometry, SLAM, Dataset, Autonomous Navigation, LiDAR **SMARTNav: A Visual-Inertial Dataset for Reliable Robotic State Estimation** Hojat Mirtajadini Goki, Abeje Mersha, Mohammad Aldibaja Saxion University of Applied Sciences, The Netherlands **10:15am - 10:30am** **ID: 154** / Technical Program - UAVG7: 4 ISPRS Annals Submission *Keywords:* UAV LiDAR, precision forestry, GNSS error, harvester data, data fusion, digital twin, tree species classification **Integrating Pre-Harvest UAV Scans to Enhance Harvester Tree Localization Accuracy** **Evgeny Lopatin[1], Kari Väätäinen[1], Harri Kaartinen[2], Heikki Hyyti[2], Lauri Sikanen[1], Yrjö Nuutinen[1], Mauricio Acuna[1]** [1]Natural Resources Institute Finland, Finland; [2]2Finnish Geospatial Research Institute in National Land Survey of Finland

10:30am - 11:00am	**Coffee Break - Day 3** Location: **Kaleva Hall**

11:00am - 12:15pm	**Technical Program - UAVG8: Uncrewed Remote Sensing Systems for Aquatic Environments** Location: **Kaleva** Session Chair: **Filiberto Chiabrando** Session Chair: **Harri Kaartinen** **11:00am - 11:15am** **ID: 156** / Technical Program - UAVG8: 1 ISPRS Annals Submission *Keywords:* Lidar, Positioning, Calibration, Sensor fusion, SLAM **Novel robotic mapping system for freshwater environments** Jukka Matias Mäki-Leppilampi, Heikki Hyyti, Harri Kaartinen Finnish Geospatial Research Institute FGI, Finland **11:15am - 11:30am** **ID: 109** / Technical Program - UAVG8: 2 ISPRS Archives Submission

Keywords: hydrographic survey, Optical remote sensing, Spectrally Derived Bathymetry, Airborne Laser Bathymetry.

Comparative Analyses for Determining Shallow Water Bathymetry from UAVs: a Case Study in the Adriatic Sea

Tea Duplančić Leder, Nenad Leder
University of Split, Croatia

11:30am - 11:45am
ID: 113 / Technical Program - UAVG8: 3
ISPRS Annals Submission
Keywords: Bathymetry, Laser scanning, Multispectral, Drone, Performance, LiDAR

Performance Evaluation of Drone Operated Dual Waveform Bathymetric LiDAR

Joonas Kousa[2], Teemu Hakala[1], Antero Kukko[1], Harri Kaartinen[1]
[1]Finnish Geospatial Research Institute FGI, Finland; [2]Aalto University, Finland

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11:45am - 12:00pm
ID: 175 / Technical Program - UAVG8: 4
ISPRS Annals Submission
Keywords: Multispectral UAV, Machine Learning, Aquatic invasive plants, Phenological classification, Remote Sensing

Phenological and Species-Level Classification of Aquatic Invasive Plants Using UAV Multispectral Imagery and Machine Learning

Daniel H. C. Salim[1], Caio C. S. Mello[1], Gabriel Pereira[2], Raian V. Maretto[3], Frederico S. Machado[4], Camila C. Amorim[1]

[1]Fundação Christiano Ottoni (FCO), Universidade Federal de Minas Gerais, Brazil; [2]Universidade Federal de São João del-Rei, Brazil; [3]University of Twente, the Netherlands4; [4]Petrobras Research Center, Brazil

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12:15pm - 1:15pm	**Lunch - Day 3**

1:15pm - 2:45pm	**Technical Program - UAVG9: Next-Generation AI for UAVs** Location: **Kaleva** Session Chair: **Anna-Maria Raita-Hakola**

1:15pm - 1:30pm
ID: 121 / Technical Program - UAVG9: 1
ISPRS Archives Submission
Keywords: Digital Surface Model, UAV, Crisis and Disaster Management, Mapping

Advancements on Semantic Real-Time UAV Mapping

Marc David Haubenstock, Jules Salzinger, Michael Schwingshackl, Felix Bruckmüller, Christoph Sulzbachner, Phillipp Fanta-Jende
Austrian Institute of Technology, Austria

1:30pm - 1:45pm
ID: 190 / Technical Program - UAVG9: 2
ISPRS Annals Submission
Keywords: Wildfire smoke detection, UAV imagery, Lightweight neural networks, Edge-device deployment, Fire surveillance, Framework for real-time smoke detection

Implementing real-time wildfire detection using lightweight object-detection models and machine vision sensor on Raspberry Pi 5: Fireframe, a practical framework

Jukka Joutsalainen, Maxim Vitikainen, Juuso Lehrbäck, Alexander Goldhill, Anna-Maria Raita-Hakola
University of Jyväskylä, Finland

1:45pm - 2:00pm
ID: 186 / Technical Program - UAVG9: 3
ISPRS Annals Submission
Keywords: Drone, Cloud computing, Infrared sensor, Automatic detection

An End-to-End UAV–Cloud–AI Pipeline for Infrared-Based Real-Time Person Detection in SAR Missions

Seunghyun Kim, Jeonghyo Oh, Younggon Oh, Impyeong Lee
University of Seoul, Korea, Republic of (South Korea)

2:00pm - 2:15pm
ID: 172 / Technical Program - UAVG9: 4
ISPRS Annals Submission
Keywords: foundation models, self-supervised learning, drones, generalization, multispectral

The End of Overfitting for UAV Applications - Self-Supervised Pretraining on Multispectral UAV Data

Jurrian Doornbos, Önder Babur
Wageningen University, Netherlands, The

2:15pm - 2:30pm
ID: 126 / Technical Program - UAVG9: 5
ISPRS Archives Submission
Keywords: Domain Generalization, Deep Learning, Bark Beetle, UAS, Multispectral imagery

Domain Generalization in Deep Learning for Forest Health Monitoring Using Multispectral UAS Data

Emma Jenni Johanna Turkulainen[1], Raquel Alves de Oliveira[1], Niko Koivumäki[1], Päivi Lyytikäinen-Saarenmaa[1], Roope Näsi[1], Mikko Pelto-Arvo[2], Johanna Tuviala[2], Eija Honkavaara[1]

[1]Department of Remote Sensing and Photogrammetry, Finnish Geospatial Research Institute, Espoo, Finland; [2]School of Forest Sciences, University of Eastern Finland, Joensuu, Finland

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ID: 148 / Technical Program - UAVG9: 6
ISPRS Archives Submission
Keywords: Self-learning, Federated learning, Distance-based machine-learning, hyperspectral image classification, UAV swarm, UAV trajectory optimization

Smart Drones, Smarter Learning: Federated Self-learning Minimal Learning Machine Classifier for Real-Time Hyperspectral Image Classification

Anna-Maria Raita-Hakola, Xinying Kilpi-Chen, Ilkka Pölönen
University of Jyväskylä, Finland

2:45pm	**Closing Ceremony**