The 3rd Workshop on UAVs in Multimedia: Capturing the World from a New Perspective

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ABSTRACT

Unmanned Aerial Vehicles (UAVs), also known as drones, have become increasingly popular in recent years due to their ability to capture high-quality multimedia data from the sky. With the rise of multimedia applications, such as aerial photography, cinematography, and mapping, UAVs have emerged as a powerful tool for gathering rich and diverse multimedia content. This workshop aims to bring together researchers, practitioners, and enthusiasts interested in UAV multimedia to explore the latest advancements, challenges, and opportunities in this exciting field. The workshop will cover various topics related to UAV multimedia, including aerial image and video processing, machine learning for UAV data analysis, UAV swarm technology, and UAV-based multimedia applications. In the context of the ACM Multimedia conference, this workshop is highly relevant as multimedia data from UAVs is becoming an increasingly important source of content for many multimedia applications. The workshop will provide a platform for researchers to share their work and discuss potential collaborations, as well as an opportunity for practitioners to learn about the latest developments in UAV multimedia technology. Overall, this workshop will provide a unique opportunity to explore the exciting and rapidly evolving field of UAV multimedia and its potential impact on the wider multimedia community.

CCS CONCEPTS

• **Computing methodologies → Vision for robotics**.

KEYWORDS

UVA Multimedia Understanding, Drone-based Video Analysis

ACM Reference Format:
Tingyu Wang, Yujiao Shi, Fabian Deuser, Shaofei Huang, Guosheng Hu, Si Liu, Zhedong Zheng, and Roger Zimmermann. 2025. The 3rd Workshop on UAVs in Multimedia: Capturing the World from a New Perspective. In *Proceedings of the 33rd ACM International Conference on Multimedia (MM '25), October 27 - 31 2025, Dublin, Ireland*. ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3581783.3610937

1 BACKGROUND AND MOTIVATION

Unmanned Aerial Vehicles (UAVs), also known as drones, have become increasingly popular in recent years due to their ability to capture high-quality multimedia data from the sky. This has opened up a wide range of possibilities for applications such as aerial photography [16, 36], cinematography [3, 14], mapping [1, 9, 11, 31, 40], agriculture [7, 15], geo-localization [12, 18–25] and delivery [4, 26]. UAVs have emerged as a powerful tool for gathering rich and diverse multimedia content, providing a unique vantage point with less occlusions [13, 27, 34, 35] and the ability to capture data from previously inaccessible or hard-to-reach locations (see Figure 1). The use of UAVs in multimedia applications has become even more significant in recent years with the emergence of new technologies such as machine learning, computer vision, big data analytics, and transfer learning [30, 32, 42]. These technologies have the potential to revolutionize the way UAVs are used to capture and analyze multimedia content, opening up new possibilities for applications such as automated image and video analysis [8, 10, 13, 28, 41], real-time tracking [33, 35], predictive modeling [6, 17], natural language control [2] and citywide simulation [37].

The ACM Multimedia conference has been at the forefront of multimedia research for over 32 years, providing a forum for researchers and practitioners to exchange ideas, explore the latest advancements, and discuss the challenges facing the field. In recent years, the conference has also started to cover the topic of UAV

MM '25, October 27 - 31, 2025, Dublin, Ireland

ACM ISBN 979-8-4007-0108-5/23/10.
https://doi.org/10.1145/3581783.3610937

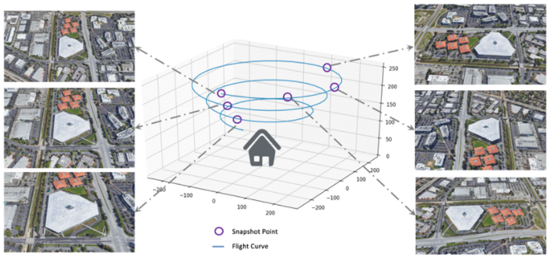

Figure 1: Different from conventional devices, UAV is a controllable aerial information capture platform with diverse viewpoints.

multimedia, recognizing the growing importance of this area of research [5, 29, 34, 35, 40]. The use of UAVs to capture multimedia data is becoming increasingly common, and the data captured by UAVs is becoming an important source of content for many multimedia applications. Therefore, we think it is good timing to hold a workshop for people with different backgrounds to communicate.

This workshop is the 3rd workshop on UAVs in Multimedia (UAVM) since 2023 [38, 39]. Both UAVM'23 and UAVM'24 challenge attracted approximately 50 registered participants, 20 teams from various countries provided results in the challenge. UAVM'23 accepted 13 workshop papers, while UAVM'24 accepted 7 papers. The motivation behind this workshop is to contribute to this ongoing conversation and provide a platform for experts in the field of UAV multimedia to discuss the latest research and developments. The workshop will cover a wide range of topics related to UAV multimedia, including image and video processing, machine learning, swarm technology, and applications such as aerial photography, cinematography, and mapping. For instance, the cross-view matching is also included, as shown in Figure 2. Through this workshop, we hope to bring together experts from academia and industry to share their insights and expertise on UAV multimedia, explore the latest advancements and challenges in the field, and encourage new collaborations and research initiatives. By doing so, we believe that this workshop will contribute to the ongoing dialogue on UAV multimedia and its role in the wider multimedia community.

2 TARGET AUDIENCE & PROMOTION

We plan to promote the UAV workshop in order to increase audience awareness and interest, targeting researchers, academics, industry data scientists and engineers, as well as other parties interested in the latest developments and advances in the field. To achieve this, we will take several measures: **1).** Use social media platforms, such as Twitter and Facebook, to promote the workshop topic and event. We will create an event page on Facebook and invite people to attend, as well as share updates about the workshop on Twitter. **2).** Create a website for the UAV workshop that provides detailed information about the agenda, speakers, and registration. We will share the website link on our social media platforms to make it accessible to a wider audience. By utilizing social media, we aim to increase the visibility of our UAV workshop and attract a diverse range of attendees from various fields who are interested in learning about the latest research and opportunities in UAVs.

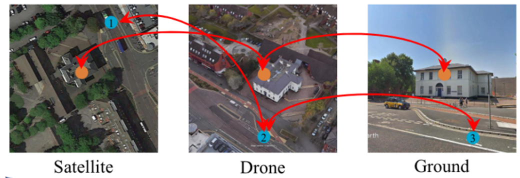

Figure 2: A cross-view matching example between three platforms, *i.e.*, satellite, drone and ground. The figure is credited by LPN [31].

3 TOPICS AND THEMES

Topics covered in this workshop (but not limited to) is as follows:

- Video-based UAV Navigation
  - Satellite-guided & Ground-guided Navigation
  - Path Planning and Obstacle Avoidance
  - Visual SLAM (Simultaneous Localization and Mapping)
  - Sensor Fusion and Reinforcement Learning for Navigation
- UAV Swarm Coordination
  - Multiple Platform Collaboration
  - Multi-agent Cooperation and Communication
  - Decentralized Control and Optimization
  - Distributed Perception and Mapping
- UAV-based Object Detection and Tracking
  - Aerial-view Object Detection, Tracking and Re-identification
  - Aerial-view Action Recognition
- UAV-based Sensing and Mapping
  - 3D Mapping and Reconstruction
  - Remote Sensing and Image Analysis
  - Disaster Response and Relief
- UAV-based Delivery and Transportation
  - Package Delivery and Logistics
  - Safety and Regulations for UAV-based Transportation

4 ACTIVITIES AND INVITED KEYNOTES

We plan to hold a hybrid format of workshop, *i.e.*, both onsite and online. For the onsite one at least two organizers will attend in person to host the workshop. The workshop will include two major activities, the invited keynotes, and the paper presentations. We will invite keynote presentations for a half-day workshop, following by accepted workshop presentations. The speakers are the experts on the relevant community from different organizations globally. The schedule of the workshop activities are listed in Table 1.

5 PAPER SUBMISSION AND REVIEWING

5.1 Challenge Dataset

This year's focus is specifically on matching partial street images to corresponding satellite images (illustrated in Figure 3). By concentrating on partial views, our aim is to more accurately reflect real-world scenarios where obstructions or limited sensor angles may restrict the field of view, such as during low-altitude UAV operations for navigation, search-and-rescue missions, and autonomous flight. We harness University-1652 [40] as the challenge dataset, which provides 2,579 street images as query and 951 gallery satellite images. To encourage broader participation and innovation, we will make University-1652 training set available through our website with name-masked test set, along with a public leaderboard.

Table 1: Schedule of workshop activities.

Topic	Duration	Speaker	Organization
• **Morning Schedule**			
An opening of the workshop	5 min	Tat-seng Chua	National University of Singapore
Where We Are and What We're Looking At	30 min	Mubarak Shah	University of Central Florida
From Coarse Global to Fine Structure from Motion	30 min	Gim Hee Lee	National University of Singapore
Coffee Break	10 min		
Round Table Discussion	30 min	Workshop Host	
Geometry-guided street-view panorama synthesis	30 min	Hongdong Li	Australian National University
Revisiting Near/Remote Sensing with Geospatial Attention	30 min	Nathan Jacobs	Washington University in St. Louis
• **Afternoon Schedule**			
Paper1 Presentation	20 min	TBD	
Paper2 Presentation	20 min	TBD	
Paper3 Presentation	20 min	TBD	
...			

Table 2: Here, we show the result on University-1652. Street2Satellite is quite challenging.

Method	University-1652 Street → Satellite R@1	University-1652 Street → Satellite AP
Baseline [40]	**1.28**	**2.29**
LPN [31]	0.81	2.21

Figure 3: Samples for Street2Satellite in Our Challenge.

5.2 Submission Types

In this workshop, we welcome two types of submissions, all of which should relate to the topics and themes as listed in Section 3: **(1).** Challenge papers (up to 4 pages in length, plus unlimited pages for references): original solution to the Challenge data, University160k, in terms of effectiveness and efficiency. **(2).** Original papers (up to 4 pages in length, plus unlimited pages for references): original ideas, perspectives, research vision, and open challenges in the area of evaluation approaches for UAVs in Multimedia; Page limits include diagrams and appendices.

6 ORGANIZER INFORMATION

Tingyu Wang (https://scholar.google.com/citations?user=wv3H-F4AAAAJ) is an assistant professor at the School of Communication Engineering, Hangzhou Dianzi University, China. He received his Ph.D. degree from the Lab of Intelligent Information Processing, Hangzhou Dianzi University, in 2023, supervised by Prof. Chenggang Yan. He has co-organized two workshops at ACM MM (2023 & 2024), focusing on scene understanding from UAVs' perspectives.

Yujiao Shi (https://yujiaoshi.github.io/) is an Assistant Professor at ShanghaiTech University. She was previously a research fellow and PhD student at the Australian National University, supervised by Prof. Hongdong Li. Her research interests include multi-modal retrieval, registration and translation, 3D vision, and self-supervised learning. She was a tutorial speaker on aerial image-based localization at CVPR 2023.

Fabian Deuser (https://skyy93.github.io/) is a PhD student at the University of the Bundeswehr Munich, supervised by Prof. Norbert Oswald (UniBW Munich) and Prof. Martin Werner (TU Munich). His research focuses on retrieval with deep learning and contrastive learning. He was a program committee member for the ACM SIGSPATIAL 2023 GeoSearch Workshop and is a two-time winner of the UAVM Workshop at ACM MM (2023, 2024).

Shaofei Huang (https://spyflying.github.io/) is a PhD candidate at the Institute of Information Engineering, Chinese Academy of Sciences, supervised by Prof. Jizhong Han and Prof. Si Liu. Her research interests include multimedia analysis and autonomous driving. She has published 15+ papers in top conferences and journals. She was awarded the China National Scholarship and Excellent Prize of President Scholarship of Chinese Academy of Sciences.

Guosheng Hu (https://huguosheng.github.io/) is a senior lecturer at university of Bristol. Before this, he served as the Head of Research at Oosto. Prior to his role at Oosto, he was a Research Fellow in the THOTH team at INRIA Grenoble Rhone-Alpes, France. Dr. Hu earned his PhD under the supervision of Prof. Josef Kittler at the University of Surrey, UK. His expertise lies in the intersection of computer vision and deep learning. With a robust academic background, he has published numerous research papers at major conferences and journals.

Si Liu (https://colalab.net/) is a full professor at Beihang University and a recipient of the National Science Fund for Excellent Young Scholars. She earned her Ph.D. from Institute of Automation, Chinese Academy of Sciences. Her research focuses on embodied intelligence and multimodal understanding. She has received Best Paper Awards at ACM MM 2013 & 2021, Best Technical Demo Award (ACM MM 2012), and Best Video Award (IJCAI 2021). She has organized four workshops (ECCV 2018, ICCV 2019, CVPR 2021, ACM MM 2022) and served as area chair for ICCV, CVPR, ECCV, and ACM MM, and associate editor for TMM, TCSVT, and CVIU.

Zhedong Zheng (https://zdzheng.xyz) is an assistant professor with the University of Macau. He was a research fellow at School of Computing, National University of Singapore. He received the Ph.D. degree from the University of Technology Sydney, Australia, in 2021 and the B.S. degree from Fudan University, China, in 2016. He received the IEEE Circuits and Systems Society Outstanding Young Author Award of 2021. He has organized a special session on reliable retrieval at ICME'22, two workshops at ACM MM'23 and one workshop at ACM ICMR'24. Besides, he is invited as a keynote speaker at CVPR'20, CVPR'21, a tutorial speaker at ACM MM'22. He also serves as an area chair for ACM MM'24 and ICASSP'25.

Roger Zimmermann (https://www.comp.nus.edu.sg/cs/people/rogerz/) is a Full Professor at the School of Computing at the National University of Singapore (NUS). He is a Co-PI with the Grab-NUS AI Lab. From 2011 to 2021 he was a Deputy Director with the NUS Smart Systems Institute (SSI) and from 2010 to 2016 he co-directed the Centre of Social Media Innovations for Communities (COSMIC), a research institute funded by the National Research Foundation (NRF) of Singapore. Prior to joining NUS he held the positions of Research Area Director with the Integrated Media Systems Center (IMSC) and Research Assistant Professor at the University of Southern California (USC). He earned his M.S. and Ph.D. degrees from the Viterbi School of Engineering at the University of Southern California.

Acknowledgment. We really appreciate Dinnovate Technology (https://www.dinnovate.cn/) providing us the real satellite data that they collected in urban scenes during different weather.

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