

PROCEEDINGS OF SPIE

# ***Ninth International Conference on Computer Graphics and Virtuality (ICCGV 2026)***

**Haiquan Zhao**  
*Editor*

**28–30 March 2026**  
**Chengdu, China**

*Sponsored by*  
Southwest Jiaotong University (China)  
Xihua University (China)

*Published by*  
SPIE

**Volume 14315**

Proceedings of SPIE 0277-786X, V. 14315

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at [SPIDigitalLibrary.org](http://SPIDigitalLibrary.org).

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Ninth International Conference on Computer Graphics and Virtuality (ICCGV 2026)*, edited by Haiquan Zhao, Proc. of SPIE 14315, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9798902327332

ISBN: 9798902327349 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)

[SPIE.org](http://SPIE.org)

Copyright © 2026 Society of Photo-Optical Instrumentation Engineers (SPIE).

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL  
LIBRARY**

[SPIDigitalLibrary.org](http://SPIDigitalLibrary.org)

---

**Paper Numbering:** A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

# Contents

v *Conference Committee*

---

## VISUAL-BASED IMAGE DETECTION AND APPLICATION

- 14315 02 **Visual enhancement transformer for video moment retrieval and highlight detection**  
[14315-27]
- 14315 03 **Infrared small target detection based on low-rank sparse decomposition with adaptive background complexity prior** [14315-14]
- 14315 04 **Trajectory-based continuous collision detection with velocity-extended spatial partitioning and temporal substepping for particle simulation in two-dimension** [14315-1]
- 14315 05 **YOLOv8-PKD: enhanced YOLOv8-Seg with poly-kernel inception, SimVSS-partial fusion, and dynamic upsampling for semantic segmentation** [14315-13]

---

## IMAGE FEATURE EXTRACTION AND FUSION TECHNOLOGY

- 14315 06 **MCSF-Net: a multimodal image fusion network based on compressive sensing** [14315-8]
- 14315 07 **AMDF-UNet: a boundary-enhanced adaptive multi-scale feature fusion network for abdominal CT multi-organ segmentation** [14315-10]
- 14315 08 **Dynamic multi-scale fusion single image super-resolution: a method based on Swin Transformer** [14315-15]
- 14315 09 **MSA-VMUNet: multi-scale augmented visual Mamba UNet for medical image segmentation** [14315-4]

---

## VIRTUAL TECHNOLOGY AND HUMAN COMPUTER INTERACTION

- 14315 0A **AU-Xception: a multi-task facial expression recognition method for VR occlusion** [14315-12]
- 14315 0B **A hybrid multi-criteria decision-making framework for evaluating the user experience of digital exhibition** [14315-22]
- 14315 0C **A serious 3D game for children with Autism Spectrum Disorder** [14315-19]
- 14315 0D **From text to immersive 3D: an end-to-end pipeline for automated retrieval-augmented virtual room generation** [14315-16]

#### DESIGN AND DEVELOPMENT OF VISUAL Q&A SYSTEM BASED ON HUMAN COMPUTER INTERACTION

---

- 14315 OE **Comparative study of traditional digital modeling and AIGC generative 3D modeling for Minnan patterned tile** [14315-20]
- 14315 OF **OC-CDGS: Octree-structured Gaussian splatting with combined depth regularization for sparse view synthesis** [14315-26]
- 14315 OG **VizAdapt: novel dataset development with a voice-interactive visual question answering system for blind and low vision individuals** [14315-28]

#### AI DRIVEN DIGITAL IMAGE ANALYSIS AND COMPUTATION MODEL

---

- 14315 OH **Improved total variation regularized physics-informed neural network for unsupervised image denoising** [14315-18]
- 14315 OI **Decentralized multimodal medical image segmentation via federated learning and segment anything model** [14315-6]
- 14315 OJ **DAILStyler: localized image style transfer via diffusion with alternating injection of two styles** [14315-7]
- 14315 OK **A multi-scale decoupled knowledge distillation method for lightweight skin lesion classification** [14315-11]
- 14315 OL **CER-SAM: a coarse-guided edge refinement network for skin lesion segmentation with SAM and its derivatives** [14315-17]
- 14315 OM **A discussion on the theoretical framework of empowering the interpretation of cultural symbols by artificial intelligence** [14315-3]