PROCEEDINGS OF SPIE

Real-time Processing of Image, Depth and Video Information 2023

Matthias F. Carlsohn Editor

24–25 April 2023 Prague, Czech Republic

Sponsored by SPIE

Co-sponsored by The Imaging Source Europe GmbH (Germany)

Cooperating Organisations
ELI Beamlines (Czech Republic)
HiLASE (Czech Republic)
Laserlab Europe
AWE (United Kingdom)
STFC (United Kingdom)

Published by SPIE

Volume 12571

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 SPIEDigitalLibrary.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 Real-time Processing of Image, Depth and Video Information 2023, edited by Matthias F. Carlsohn, Proc. of SPIE 12571, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510662629

ISBN: 9781510662636 (electronic)

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) SPIE.org

Copyright © 2023 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. 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.

 $\hbox{Publication of record for individual papers is online in the SPIE Digital Library.}$



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

Conference Committee vii Introduction **REAL-TIME IMAGING** 12571 03 Evolution of real-time processing of visual information over four decades: a retrospective as outlook to the future of real-time imaging (Invited Paper) [12571-1] 12571 04 Real-time embedded large-scale place recognition for autonomous ground vehicles using a spatial descriptor [12571-2] 12571 05 RECASA: real-time computer-assisted sperm analysis [12571-3] 12571 06 Real-time video super-resolution reconstruction using wavelet transforms and sparse representation [12571-4] 12571 07 Parallel semi-fragile color image watermarking authentication scheme using EXIF metadata [12571-5] LIGHT FIELD IMAGING 12571 08 Development of light-field motion tracking technology for use in laboratory studies of planet formation (Best Student Paper Award) [12571-6] 12571 09 Towards learning-based denoising of light fields [12571-7] 12571 0A Real-time 3D tracking of a microparticle using chromatic aberration (Best Paper Award) [12571-8] 12571 OB Real-time onboard visual parking space detection: a performance study [12571-9] MACHINE LEARNING AND AI 12571 0D An automated AI and video measurement techniques for monitoring social distancing, mask detection, and facial temperature screening for COVID-19 [12571-11] Computational efficient deep learning-based super resolution approach [12571-12] 12571 OE 12571 OF In-sensor neural network for real-time KWS by image processing [12571-13]

12571 0G	Low-power CNN for real-time driver posture monitoring by image processing [12571-14]
	SENSING AND CODING
12571 OJ	Sparse video representation using steered mixture-of-experts with global motion compensation [12571-17]
12571 OK	Steered mixture-of-experts autoencoder design for real-time image modelling and denoising [12571-18]
	POSTER SESSION
12571 OM	Real-time rotational obstacle detection-based intelligent safety management for construction machines [12571-20]