PROCEEDINGS OF SPIE

Autonomous Systems for Security and Defence

Judith Dijk
Jose Luis Sanchez-Lopez
Editors

16–17 September 2024 Edinburgh, United Kingdom

Sponsored by

Event Sponsor Leonardo MW Ltd. (United Kingdom)

General Sponsors

HGH Infrared Systems (France) • Photon Lines Ltd. (United Kingdom) • Pro-Lite Technology Ltd. (United Kingdom) • Thales (United Kingdom)

Cooperating Organisations

Cranfield University (United Kingdom) • Quantum Security and Defense Working Group (United Kingdom) • CENSIS (United Kingdom) • Innovate UK (United Kingdom) • Optoelectronics Research Centre (United Kingdom) • Photonics21 (Germany) • Technology Scotland (United Kingdom) • Science and Technology Facilities Council (United Kingdom) UKQuantum (United Kingdom) • Visit Britain (United Kingdom)

Published by SPIE

Volume 13207

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 Autonomous Systems for Security and Defence, edited by Judith Dijk, Jose Luis Sanchez-Lopez, Proc. of SPIE 13207, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510681224

ISBN: 9781510681231 (electronic)

Published by

SPIE

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

Copyright © 2024 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.

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

v Conference Committee

APPLICATIONS AND USE CASES

13207 02	Semi-autonomous UGV for reconnaissance in counter-IED and CBRN missions (Invited Paper) [13207-1]
13207 03	Project HUGIN: heterogeneous unmanned group of intelligent USVs [13207-2]
13207 04	MUSAL: towards multisource 4D scene modeling by autonomous robot systems for the surveillance of critical infrastructure (Invited Paper) [13207-3]
13207 05	Creation of digital models for accelerated and reliable testing of automated systems in adverse weather $[13207\text{-}4]$
13207 06	An EO/IR monitoring system for noncontact physiological signal analysis in automated vehicles [13207-5]
	AUTONOMOUS PLANNING AND NAVIGATION
13207 08	Obstacle avoidance for unmanned wing-in-ground vehicles (Invited Paper) [13207-6]
13207 09	Autonomous sensor control for mobile platforms operating in teams [13207-7]
13207 0A	Utilizing synthetic data for object segmentation on autonomous heavy machinery in dynamic unstructured environments [13207-8]
13207 OB	Self-organizing control for unmanned ground vehicles [13207-9]
	OBJECT DETECTION AND CLASSIFICATION I
13207 0D	On the use of appearance features for multiple object tracking in a maritime scenario [13207-11]
13207 0E	Real-time small object detection on embedded hardware for 360-degree vision [13207-12]

OBJECT DETECTION AND CLASSIFICATION II

13207 0G	Drone-based monitoring on the edge using a high-resolution payload [13207-14]
13207 OH	Investigation of multisource object detection fusion for improving scene awareness for enhanced autonomy [13207-16]
13207 OI	A performance evaluation for systems for the detecting, tracking, and identification of illicit drones [13207-17]
	POSTER SESSION
13207 OK	Comparative energy management system study for efficient and agile hybrid unmanned wing-in-ground vehicles [13207-19]
13207 OL	A novel background suppression-based image fusion algorithm [13207-20]