PROCEEDINGS OF SPIE

Detection and Sensing of Mines, Explosive Objects, and Obscured Targets XXVI

Steven S. Bishop Jason C. Isaacs Editors

12–16 April 2021 Online Only, United States

Sponsored and Published by SPIE

Volume 11750

Proceedings of SPIE 0277-786X, V. 11750

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

Detection and Sensing of Mines, Explosive Objects, and Obscured Targets XXVI, edited by Steven S. Bishop, Jason C. Isaacs, Proc. of SPIE Vol. 11750, 1175001 © 2021 SPIE · CCC code: 0277-786X/21/\$21 · doi: 10.1117/12.2598612

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 Detection and Sensing of Mines, Explosive Objects, and Obscured Targets XXVI, edited by Steven S. Bishop, Jason C. Isaacs, Proc. of SPIE 11750, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510643376

ISBN: 9781510643383 (electronic)

Published by

SPIE

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

SPIE.org

Copyright © 2021 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

EMI SENSOR PROCESSING TECHNIQUES 11750 02 Electromagnetic induction sensing of unexploded ordinance and soil properties from unmanned aerial systems [11750-1] 11750 03 High frequency EMI sensing for detection and location of underground metallic utilities [11750-2] 11750 04 Buried IED targets detection and identification using advanced HFEMI models [11750-3] **GRP SENSOR PROCESSING TECHNIQUES** 11750 05 Wire detection by GPR using the Hough transform [11750-4] Ultra-wideband ground penetrating radar with orbital angular momentum control [11750-6] 11750 07 PROCESSING TECHNIQUES AND ARCHITECTURE 11750 08 New data for analyze improvised explosives in forensic practice [11750-7] GPRStudio: an extensible cross-platform GPR signal processing tool [11750-8] 11750 09 A novel GPR signal processing environment running on containers [11750-9] 11750 0A 11750 OB Improving explosive hazard detection with simulated and augmented data for an unmanned aerial system [11750-10] 11750 0C Metadata enabled contextual sensor fusion for unmanned aerial system-based explosive hazard detection [11750-11] POSTER SESSION 11750 OE High-precision sensing of chemical warfare simulants using mid-infrared spectroscopy [11750-13]