

PROCEEDINGS OF SPIE

International Conference on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture (RSE 2022)

Victoria Shamraeva
Arthur Gibadullin
Editors

19–21 April 2022
Dushanbe, Republic of Tajikistan

Organized by
Tajik Technical University named after Academician M.S. Osimi (Tajikistan)

Sponsored and Published by
SPIE

Volume 12296

Proceedings of SPIE 0277-786X, V. 12296

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

Intl. Conf. on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture (RSE 2022),
edited by Shahriyor Sadullozoda, Arthur Gibadullin, Proc. of SPIE Vol. 12296,
1229601 · © 2022 SPIE · 0277-786X · doi: 10.1117/12.2646624

Proc. of SPIE Vol. 12296 1229601-1

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.

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 *International Conference on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture (RSE 2022)*, edited by Shahriyor Sadullozoda, Arthur Gibadullin, Proc. of SPIE 12296, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510656475
ISBN: 9781510656482 (electronic)

Published by

SPIE

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

Telephone +1 360 676 3290 (Pacific Time)

SPIE.org

Copyright © 2022 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.

SPIE. DIGITAL LIBRARY

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	<i>Conference Committee</i>
vii	<i>Introduction</i>

INFORMATION TECHNOLOGIES IN ECOLOGY AND PROBLEMS OF ECOLOGICAL SAFETY

12296 02	Near-real-time flood mapping of the Amur River basin from sentinel-2 MSI data using deep learning [12296-3]
12296 03	Electronic cadastre of protected areas as a tool to increase the efficiency of biodiversity conservation measures [12296-36]
12296 04	Using deep convolutional neural networks for mapping of rill erosion of the pre-Volga region (Republic of Tatarstan, Russia) [12296-51]
12296 05	The remote sensing use in the control of forest cuttings [12296-2]
12296 06	On renewal felling in the forests of the North-Taiga forest region of the European part of the Russian Federation [12296-7]
12296 07	Pyrogenic factor impact on the forest area dynamics in the Baikal natural territory: the case of the Kichera river basin [12296-8]
12296 08	The role of Russian forests in the compensation of CO₂ emissions in the atmosphere and the possibility of application of digital technologies in solving the issues of forest restoration and forestry [12296-4]
12296 09	Technical solutions of reducing oil pollution of the forest environment during harvesting [12296-33]

GEOINFORMATICS, GEOENGINEERING, DIGITAL TECHNOLOGIES AND ENGINEERING IN AGRICULTURE

12296 0A	Sustainable development and environmental management of the region based on economic and mathematical modeling [12296-5]
12296 0B	Factors affecting the thermal efficiency of the engine cooling system of cars and tractors [12296-12]
12296 0C	Decision making model on the choice of crops for cultivation in uncertain weather conditions based on game theory [12296-15]
12296 0D	Effective management of energy resources using the decision support system at the agrocomplex "Gorny" Ust-Katav [12296-16]

- 12296 OE **Alternative waste disposal of agricultural enterprises as a source of biogas: experience and prospects of the Southern Urals** [12296-17]
- 12296 OF **Management of farmland quality in the Leningrad region** [12296-29]
- 12296 OG **Determining the longitudinal of the distance from the soil-deepener mounted on the work-improved plug to the over turner behind it** [12296-30]
- 12296 OH **The use of a complex unit when irrigating cotton** [12296-31]
- 12296 OI **Analysis of technologies and means of mechanization of manure removal and use in small livestock farms** [12296-50]
- 12296 OJ **Use of remote positioning technologies to determine damage in case of misuse of agricultural land** [12296-1]
- 12296 OK **Comprehensive assessment of the technical condition of the 10 kV rural electrical network using the MATLAB software at various load factors of the 10/0.4 kV transformer substation** [12296-10]
- 12296 OL **Parameters of the electric drive of a cargo electric vehicle for breeding and seed production** [12296-11]
- 12296 OM **The use of information technologies in the field of land monitoring and agrochemical services for agricultural enterprises in the Tyumen region as the basis for increasing the efficiency of crop production** [12296-14]
- 12296 ON **Indicators of young cattle and beef in Russia** [12296-34]
- 12296 OO **Technological process of provisional dig a ditch** [12296-28]
- 12296 OP **Information system "farms of the Republic of Uzbekistan"** [12296-35]
- 12296 OQ **Oil conditioning sensors for online heavy-duty engine health monitoring based on the control of a limited number of parameters** [12296-38]
- 12296 OR **The concept of a personal information system to improve the efficiency of agricultural tractor management** [12296-40]
- 12296 OS **Features of enzymatic hydrolysis of fibers of genetically different cotton lines** [12296-41]
- 12296 OT **Development of a simulation model for using a swarm of UAVs in agriculture** [12296-49]
- 12296 OU **Results of mathematical modeling of nostatic temperature temperature heating of "livestock heat complex" through the use of solar and bio energy** [12296-43]

Conference Committee

Conference Chairs

- Kudrat Daylatzoda**, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Shakhriyor Sadullozoda, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Mamadamon Abdullo, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Artur Gibadullin, State University of Management (Russian Federation)

Program Committee

- Angel Smrikarov**, Angel Kanchev University of Ruse (Bulgaria)
Yuhfizar, Padang State Polytechnic (Indonesia)
Kongratboy Sharipov, Tashkent State Economic University (Uzbekistan)
Yuri Firsov, Prague Institute for Advanced Study (Czech Republic)
Tarun Chakravorty, Canadian University of Bangladesh (Bangladesh)
Sergey Shmanev, Financial University under the Government of the Russian Federation (Russian Federation), European Academy of Natural Sciences (Germany)
Ganisher Rakhimov, Denau Institute of Entrepreneurship and Pedagogy (Uzbekistan)
Irek Fakhruddinov, Academy of Sciences of the Republic of Tatarstan (Republic of Tatarstan)
Zafar Usmanov, Academician of the National Academy of Sciences of the Republic of Tajikistan (Republic of Tajikistan)
Izatullo Ganiev, National Academy of Sciences of the Republic of Tajikistan, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Haydar Odinazoda, National Academy of Sciences of the Republic of Tajikistan, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Alfiya Akhrorova, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Gulom Uzakov, Karshi Engineering and Economic Institute (Republic of Uzbekistan)
Imomerbek Kalandarbekov, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)
Mohira Zaripova, Tajik Technical University named after Academician M.S. Osimi (Republic of Tajikistan)

Manuchehr Sadriddinov, Branch of the International University of
Tourism and Entrepreneurship of Tajikistan in the Sughd region
(Republic of Tajikistan)

Introduction

We are glad to present the collection of materials of the International scientific and practical conference "Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology and Agriculture" (RSE2022), which took place April 19-21, 2022 at Tajik Technical University named after Academician M.S. Osimi (Dushanbe, Republic of Tajikistan). Due to restrictive measures on the territory of the Republic of Tajikistan, in connection with COVID-19, the meeting was held in a virtual format. The conference was held on the Microsoft Teams platform, which allowed all participants to present their materials from anywhere in the world.

The conference is held to develop new information technologies for the purposes of Earth sensing, cartography, geodesy, cadastre, land management, ecology and agriculture. Within the framework of the program of studying international experience in remote sensing of the earth's surface, the development of modern technologies to ensure the functioning of virtual and information technologies and the formation of new directions for the development of technologies in this direction.

The topics of the conference were as follows:

- Geoinformatics and information technology in cartography;
- Information technologies in ecology and problems of ecological safety;
- Geoinformatics, geoengineering, digital technologies and engineering in agriculture;
- Agriculture, field cultivation, animal husbandry, forestry and agricultural products.

As part of the section reports, work on the development of information technologies and engineering in agriculture, ecology, cartography, geodesy, cadastre, land management and Earth sounding was heard.

The conference was attended by representatives of scientific, government and commercial organizations, representatives of agricultural universities, as well as scientists from near and far abroad. Among the conference participants are representatives of five states: Poland, Republic of Uzbekistan, Republic of Kazakhstan, Republic of Tajikistan and Russian Federation.

The conference made it possible to form new scientific results in the following areas:

- Development of scientific and practical potential in order to form proposals for the introduction of high technologies in agriculture;
- The formation of new directions in remote sensing of the earth's surface, the development of modern technologies to ensure the functioning of virtual and information technologies and the formation of new directions of development;

- Formation of recommendations aimed at improving technical systems and information technologies in matters of biological diversity conservation. Thus, the conference made it possible to formulate new scientific directions and recommendations for the development of information technologies and engineering.

The organizing committee of the conference expresses its gratitude to the staff of SPIE, who helps to place the proceedings of scientific conferences in SPIE Digital Library and provide support for the publication of materials.

In addition, the organizing committee would like to thank the conference participants; reviewers and everyone who helped organize this conference and form the presented volume for publication in the SPIE Digital Library.

**Shahriyor Sadullozoda
Mamadamon Abdullo**