Front Matter: Volume 7489
PIAGENG 2009

Image Processing and Photonics for Agricultural Engineering

Honghua Tan
Qi Luo
Editors

11–12 July 2009
Zhangjiajie, China

Organized by
IITA—Intelligent Information Technology Application Research Association (China)
IEEE SMC Technical Committee on Education Technology and Training (United States)
Wuhan Institute of Technology (China)
Asia Pacific Human-Computer Interaction Center (Hong Kong, China)

Sponsored by
IITA—Intelligent Information Technology Application Research Association (China)

Published by
SPIE

Volume 7489
The papers included 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. The papers published in these proceedings 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 this book:

ISSN 0277-786X
ISBN 9780819478009

Published by
SPIE
P.O. Box 10, Bellingham, Washington 98227-0010 USA
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445
SPIE.org

Copyright © 2009, Society of Photo-Optical Instrumentation Engineers

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 copying fees. The Transactional Reporting Service base fee for this volume is $18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online 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. The CCC fee code is 0277-786X/09/$18.00.

Printed in the United States of America.

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

SPIEDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four 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, 0C, 0D, 0E, 0F, 10, 11, 12, 13, ..., 1Z, followed by 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.


### Contents

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>vii</td>
<td>Conference Committee</td>
</tr>
<tr>
<td>ix</td>
<td>Introduction</td>
</tr>
</tbody>
</table>

**PIAGENG 2009: IMAGE PROCESSING AND PHOTONICS FOR AGRICULTURAL ENGINEERING**

7489 02 Inner Mongolia soil moisture retrieved from MODIS image and TVDI model [7489-01]  
L. Guo, Y. Bao, G. Bao, Inner Mongolia Normal Univ. (China); Q. Hai, Inner Mongolia Normal Univ. (China) and Baotou Normal College (China)

7489 03 Application of near-infrared image processing in agricultural engineering [7489-02]  
M. Chen, G. Zhang, H. Xia, Huazhong Normal Univ. (China)

7489 04 A new algorithm of wire-like noise removal for colored rice kernel images [7489-03]  
Q. Liu, S. Qin, Beijing Univ. of Aeronautics and Astronautics (China)

7489 05 An automatic food recognition algorithm with both shape and texture information [7489-04]  
Y. Deng, S. Qin, Y. Wu, Beihang Univ. (China)

7489 06 Despeckling SAR images using adaptive bandelet transform and Bayesian maximum a posteriori estimation [7489-05]  
Q. Gao, Y. Xu, Y. Lu, W. Zhong, Anhui Univ. (China)

7489 07 A rapid algorithm of road boundary extraction in universal remote sensing images [7489-06]  
X. Zhu, X. Wang, Zhejiang Gongshang Univ. (China)

7489 08 Research on calibrating the vision-guide motion control system [7489-07]  
H. Yang, East China Institute of Technology (China)

7489 09 The simulation of SAR image of nature scene [7489-08]  
X. Wen, Cold and Arid Regions Environment and Engineering Research Institute (China), Ctr. for Earth Observation and Digital Earth (China), and Graduate Univ. of the Chinese Academy of Sciences (China); C. Wang, H. Zhang, Ctr. for Earth Observation and Digital Earth (China)

7489 0A Application of grey relation analysis in image’s edge detection of pests in stored grain [7489-09]  
L. Zhou, M. Fang, X. Wang, Y. Mou, Wuhan Polytechnic Univ. (China); M. Chen, Huazhong Univ. of Science and Technology (China)

7489 0B Orchard spatial information extraction from SPOT-5 image based on CART model [7489-10]  
D. Li, Northeast Institute of Geography and Agricultural Ecology (China) and Graduate Univ. of the Chinese Academy of Sciences (China); S. Zhang, Northeast Institute of Geography and Agricultural Ecology (China)
Object recognition using the distance based on the characteristic of differences [7489-11]
J. Yuan, Z. Li, L. Zhang, North China Electric Power Univ. (China)

Applications of independent component analysis in SAR images [7489-12]
S. Huang, X. Cai, W. Hui, P. Xu, Xi'an Research Institute of Hi-Tech (China)

Cucumber disease diagnosis using multispectral images [7489-13]
J. Feng, H. Li, J. Shi, W. Yang, Yunnan Normal Univ. (China); N. Liao, Beijing Institute of Technology (China)

Building extraction from high-resolution remotely sensed imagery based on morphology characteristics [7489-14]
X. Xu, Institute of Geographical Sciences and Natural Resources Research (China) and Hohai Univ. (China); X. Feng, Institute of Geographical Sciences and Natural Resources Research (China); C. Wang, Hohai Univ. (China)

A semantic image retrieval approach between visual features and medical concepts [7489-15]
J. Li, H. Liang, G. Yang, Y. Feng, M. Lv, Harbin Engineering Univ. (China)

A new algorithm based on adaptive wavelet shrinkage and P_M diffusion and its application in the denoising of fruit image [7489-16]
P. Xu, Y. Huang, N. Zhao, Anhui Univ. of Science and Technology (China)

Spatial outlier detection with multiple attributes weighted [7489-17]
Z. Tang, Univ. of Electronic Science and Technology Beijing (China) and Nanhua Univ. (China); J. Yang, B. Yang, Univ. of Electronic Science and Technology Beijing (China)

Research of the head detection algorithm based on several regional growth and feature extraction [7489-18]
J. Xu, X. Chen, S. Dai, P. Mu, Univ. of Shanghai for Science and Technology (China)

Image acquisition system applied to prevention of orchard plant disease [7489-19]
S. Ma, B. Xu, S. Dai, Y. Li, East China Institute of Technology (China)

The sidebar template and extraction of invariant feature of calligraphy and painting seal [7489-20]
Z. Hu, H. Bao, H. Lou, Beijing Union Univ. (China)

Evaluation of face recognition techniques [7489-21]
B. Dai, Univ. of Electronic Science and Technology of China (China); D. Zhang, Monash Univ. (Australia); H. Liu, S. Sun, Univ. of Electronic Science and Technology of China (China); K. Li, Deakin Univ. (Australia)

Apple lesion recognition based on Fisherapples [7489-22]
Y. Meng, C. Cai, H. Hao, X. Qin, W. Song, L. Huang, Northwest A&F Univ. (China)

Butterfly image retrieval based on SIFT feature analysis [7489-23]
H. Hao, C. Cai, Y. Meng, W. Song, X. Qin, H. Zhao, Northwest A&F Univ. (China)
Apple physalospora recognition by using Gabor feature-based PCA [7489-24]
X. Qin, C. Cai, W. Song, H. Hao, Y. Meng, J. Zhu, Northwest A&F Univ. (China)

Content-based butterfly image retrieval based on keyblock distribution [7489-25]
W. Song, C. Cai, X. Qin, Y. Meng, H. Hao, Northwest A&F Univ. (China)

Spatial-information-based image segmentation using a modified evolutionary algorithm [7489-26]
Z. Gao, Y. Zhang, Mudanjiang Normal College (China)

A CP-based data mining method on image processing of agricultural engineering [7489-27]
Y. Guan, South China Univ. of Technology (China)

The application of SVD in stored grain pest image pre-processing [7489-28]
Y. Mou, Anhui Univ. of Science and Technology (China) and Wuhan Polytechnic Univ. (China); L. Zhou, Wuhan Polytechnic Univ. (China)

Preserved fruit image classification using visual contents of images [7489-29]
M. Jian, Shandong Univ. at Weihai (China); C. Zhang, Zhengzhou Univ. of Light Industry (China); L. Liu, Taishan Univ. (China); C. Yin, Shandong Water Polytechnic (China)

Nondestructive detection pesticide residue on navel orange surface using laser image [7489-30]
M. Liu, M. Yao, L. Yao, Jiangxi Agricultural Univ. (China)

A method based on edge detection to amend the error from defocused image [7489-31]
M. Shen, D. Li, Wuhan Univ. of Science and Engineering (China); F. Zhang, Zhengzhou Univ. of Light Industry (China)

Geometric distortion correction to testing image [7489-32]
F. Zhang, X. Zuo, J. Liu, X. Wu, Y. Wang, Daqing Petroleum Institute (China) and Daqing Oilfield (China)

Vision-based road detection by hidden Markov model [7489-33]
Y. Wang, D. Chen, L. Tao, Harbin Univ. of Science and Technology (China); C. Shi, Nanjing Univ. of Science and Technology (China)

A WT-FEBFNN approach to battery defect inspection [7489-34]
J. Luo, S. Lin, Tianjin Polytechnic Univ. (China); J. Ni, Tianjin Univ. of Technology (China); L. Song, Tianjin Polytechnic Univ. (China)

A novel fingerprint recognition algorithm based on VK-LLE [7489-35]
J. Luo, S. Lin, Tianjin Polytechnic Univ. (China); J. Ni, Tianjin Univ. of Technology (China); L. Song, Tianjin Polytechnic Univ. (China)

Color difference classification of fabric based on flexible neural network [7489-36]
Q. Wan, S. Liu, Z. Zhao, Wuhan Univ. of Science and Engineering (China)

System of color image segmentation using FCM and region merging method [7489-37]
G. Li, Tongji Univ. (China); X. Wei, Luoyang Normal Univ. (China); W. Shu, Tongji Univ. (China)
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Application of scan line filling to leaf image segmentation of sugarcane red rot disease</td>
<td>J. Zhao, M. Liu, M. Yao, Jiangxi Agricultural Univ. (China)</td>
</tr>
<tr>
<td>14</td>
<td>Lane detection algorithm research based on revised perspective transform</td>
<td>C. N. Zhang, T. H. Tang, X. L. Kang, M. M. Zhang, North China Univ. of Technology (China)</td>
</tr>
<tr>
<td>15</td>
<td>Speech recognition method based on genetic vector quantization and BP neural network</td>
<td>L. Gao, L. Li, Agricultural Univ. of Hebei (China); J. Zhou, Qinhuangdao Asano Cement Co., Ltd. (China); Q. Zhao, Agricultural Univ. of Hebei (China)</td>
</tr>
<tr>
<td>16</td>
<td>The edge extraction of agricultural crop leaf</td>
<td>B. Wang, Y. Cao, H. Xiao, H. Jiang, H. Liu, Northeastern Univ. (China)</td>
</tr>
<tr>
<td>17</td>
<td>An encryption-algorithm-based logistic and Henon mapping for agricultural images in remote transmission</td>
<td>Z. Zhu, Z. Lin, B. Wang, H. Liu, H. Jiang, Northeastern Univ. (China)</td>
</tr>
<tr>
<td>18</td>
<td>Development of Powell and simulated annealing algorithm applied in image registration of agricultural engineering</td>
<td>Z. Deng, B. Wang, Z. Zhu, H. Jiang, H. Liu, Northeastern Univ. (China)</td>
</tr>
<tr>
<td>19</td>
<td>Mutual information image registration based on improved bee evolutionary genetic algorithm</td>
<td>G. Xu, J. Tu, North China Electric Power Univ. (China)</td>
</tr>
<tr>
<td>1A</td>
<td>A novel image restoration model using ICA and ridgelet transform</td>
<td>G. Zhang, Z. Cui, Soochow Univ. (China)</td>
</tr>
<tr>
<td>1B</td>
<td>A Chinese minority script recognition method based on wavelet feature and multinomial naive Bayes</td>
<td>H. Guo, J. Zhao, Dalian Nationalities Univ. (China)</td>
</tr>
<tr>
<td>1C</td>
<td>A method to quantify movement activity of groups of animals using automated image analysis</td>
<td>J. Xu, H. Yu, Ningbo Univ. (China); Y. Liu, Institute of Oceanology (China)</td>
</tr>
<tr>
<td>1D</td>
<td>Research on the recognition of chironomid larvae based on SVM</td>
<td>J. Zhao, H. Guo, Dalian Nationalities Univ. (China); X. Sun, Northeast Forestry Univ. (China)</td>
</tr>
</tbody>
</table>
Conference Committee

Conference Chairs

Honghua Tan, Wuhan Institute of Technology (China)
Fan Yang, Wuhan Institute of Technology (China)

Committee Chairs

Weitao Zheng, Wuhan University of Technology (China)
Ben Kwang-Mong Sim, Hong Kong Baptist University (Hong Kong, China)

Program Committee

Shao Xi, Nanjing University of Posts and Telecommunications (China)
Xueming Zhang, Beijing Normal University (China)
Peide Liu, Shangdong Economic University (China)
Dariusz Krol, Wroclaw University of Technology (Poland)
Jason J. Jung, Yeungnam University (Korea, Republic of)
Paul Davidsson, Blekinge Institute of Technology (Sweden)
Longbing Cao, University of Technology, Sydney (Australia)
Huafeng Zhang, University of Technology, Sydney (Australia)
Qian Yin, Beijing Normal University (China)

Session Chairs

1 Image Processing in Agricultural Engineering
Qi Luo, Wuhan Institute of Technology (China)

2 Photonics in Agricultural Engineering
Qi Luo, Wuhan Institute of Technology (China)

3 GIS, GPS, RS in Agricultural Engineering
Weitao Zheng, Wuhan University of Technology (China)

4 Wireless and Optical Communications in Agricultural Engineering
Honghua Tan, Wuhan Institute of Technology (China)

5 Agricultural Decision Support and Simulation Systems
Honghua Tan, Wuhan Institute of Technology (China)

6 Intelligent Monitoring and Control/ICT Applications in Rural Areas
Honghua Tan, Wuhan Institute of Technology (China)
7  Sensor Technology in Agricultural Engineering  
  Weitao Zheng, Wuhan University of Technology (China) 

8  Other Related Information Technology in Agricultural Engineering  
  Honghua Tan, Wuhan Institute of Technology (China)
Introduction

Information technologies such as image processing, photonics, GIS, and so on are becoming more and more important for rural development. All commercial crop and animal production systems are potential users for intelligent information technology products. Many intelligent information technology systems have been developed to help farmers, extension workers, and administrators. Intelligent information technology will provide powerful means for the transformation of agriculture. Many countries have established associations or research centers for information technology in agriculture. It is necessary for experts from developed and developing countries to exchange ideas.

Welcome to the PIAGENG 2009 conference, held 11–12 July 2009, in Zhangjiajie, China. The 2009 International Conference on Photonics and Image in Agricultural Engineering is cosponsored by the Intelligent Information Technology Application Research Association (IITA Association), IEEE SMC TC on Education Technology and Training (USA), the Wuhan Institute of Technology (China), and Asia Pacific Human-Computer Interaction Research Center of Hong Kong. PIAGENG 2009 has seven sessions: Image Processing in Agricultural Engineering; Photonics in Agricultural Engineering; GIS, GPS, RS in Agricultural Engineering; Wireless and Optical Communications in Agricultural Engineering; Agricultural Decision Support and Simulation Systems; Intelligent Monitoring and Control/ICT Applications in Rural Areas; Sensor Technology in Agricultural Engineering; and Other related information technology in Agricultural Engineering.

The purpose of PIAGENG 2009 is to bring together researchers and practitioners from academia, industry, and government to exchange their research ideas and results, and to discuss the state of the art in the areas of the conference.

We thank the SPIE staff for their enthusiastic support our conference, and for their editorial work on these proceedings. We would also like to thank the program chairs, organization staff, and the members of the program committees for their hard work.

We hope that PIAGENG 2009 will be successful and enjoyable to all participants. We look forward to seeing all of you next year at the PIAGENG 2010.

Honghua Tan