

**Editor-in-Chief**

*Kai Rannenberg, Goethe University Frankfurt, Germany*

**Editorial Board**

TC 1 – Foundations of Computer Science

*Jacques Sakarovitch, Télécom ParisTech, France*

TC 2 – Software: Theory and Practice

*Michael Goedicke, University of Duisburg-Essen, Germany*

TC 3 – Education

*Arthur Tatnall, Victoria University, Melbourne, Australia*

TC 5 – Information Technology Applications

*Erich J. Neuhold, University of Vienna, Austria*

TC 6 – Communication Systems

*Aiko Pras, University of Twente, Enschede, The Netherlands*

TC 7 – System Modeling and Optimization

*Fredi Tröltzsch, TU Berlin, Germany*

TC 8 – Information Systems

*Jan Pries-Heje, Roskilde University, Denmark*

TC 9 – ICT and Society

*Diane Whitehouse, The Castlegate Consultancy, Malton, UK*

TC 10 – Computer Systems Technology

*Ricardo Reis, Federal University of Rio Grande do Sul, Porto Alegre, Brazil*

TC 11 – Security and Privacy Protection in Information Processing Systems

*Steven Furnell, Plymouth University, UK*

TC 12 – Artificial Intelligence

*Ulrich Furbach, University of Koblenz-Landau, Germany*

TC 13 – Human-Computer Interaction

*Jan Gulliksen, KTH Royal Institute of Technology, Stockholm, Sweden*

TC 14 – Entertainment Computing

*Matthias Rauterberg, Eindhoven University of Technology, The Netherlands*

## **IFIP – The International Federation for Information Processing**

IFIP was founded in 1960 under the auspices of UNESCO, following the first World Computer Congress held in Paris the previous year. A federation for societies working in information processing, IFIP's aim is two-fold: to support information processing in the countries of its members and to encourage technology transfer to developing nations. As its mission statement clearly states:

*IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.*

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

IFIP distinguishes three types of institutional membership: Country Representative Members, Members at Large, and Associate Members. The type of organization that can apply for membership is a wide variety and includes national or international societies of individual computer scientists/ICT professionals, associations or federations of such societies, government institutions/government related organizations, national or international research institutes or consortia, universities, academies of sciences, companies, national or international associations or federations of companies.

More information about this series at <http://www.springer.com/series/6102>

Daoliang Li · Zhenbo Li (Eds.)

# Computer and Computing Technologies in Agriculture IX

9th IFIP WG 5.14 International Conference, CCTA 2015  
Beijing, China, September 27–30, 2015  
Revised Selected Papers, Part II



Springer

*Editors*

Daoliang Li  
China Agricultural University  
Beijing  
China

Zhenbo Li  
China Agricultural University  
Beijing  
China

ISSN 1868-4238

ISSN 1868-422X (electronic)

IFIP Advances in Information and Communication Technology

ISBN 978-3-319-48353-5

ISBN 978-3-319-48354-2 (eBook)

DOI 10.1007/978-3-319-48354-2

Library of Congress Control Number: 2016955569

© IFIP International Federation for Information Processing 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

## Preface

The 9th International Conference on Computer and Computing Technologies in Agriculture (CCTA 2015) was held in Beijing, China, during September 27–30, 2015.

The conference was hosted by the China Agricultural University (CAU), Agricultural Information Institute of Chinese Academy of Agricultural Sciences (AIICAAAS), China National Engineering Research Center for Information Technology in Agriculture (NERCITA), China National Engineering Research Center of Intelligent Equipment for Agriculture (NERCIEA), International Federation for Information Processing (IFIP), Chinese Society of Agricultural Engineering (CSAE), Chinese Society for Agricultural Machinery (CSAM), Chinese Association for Artificial Intelligence (CAAI), Information Technology Association of China Agro-technological Extension Association, Beijing Technology Innovation Strategic Alliance for Intelligence Internet of Things, Industry in Agriculture, Beijing Society for Information Technology in Agriculture, China (BSITA), Group of Agri-Informatics, Ministry of Agriculture, China, Sino-US Agricultural Aviation Cooperative Technology Center, and the Club of Ossiach. It was sponsored by the National Natural Science Foundation of China (NSFC), Ministry of Agriculture, China (MOA), Ministry of Science and Technology, China (MOST), Ministry of Industry and Information Technology, China (MIIT), State Administration of Foreign Experts Affairs, China (SAFEA), Beijing Administration of Foreign Experts Affairs, China, Beijing Municipal Science and Technology Commission (BMSTC), Beijing Natural Science Foundation, China (BNSF), Beijing Association for Science and Technology, China (BAST), Beijing Academy of Agriculture and Forestry Sciences, China (BAAFS), Dabeinong Education Foundation, China, and the Global Forum on Agricultural Research (GFAR).

In order to promote exchange and cooperation among scientists and professionals from different fields and strengthen international academic exchange, the Joint International Conference on Intelligent Agriculture (ICIA) included the 8th International Symposium on Intelligent Information Technology in Agriculture (8th ISIITA), the 9th IFIP International Conference on Computer and Computing Technologies in Agriculture (9th CCTA), and the AgriFuture Days 2015 International Conference (Agri-Future Days 2015). These events provided a platform, for experts and scholars from all over the world to exchange techniques, ideas, and views on intelligent agricultural innovation. Nine International Conferences on Computer and Computing Technologies in Agriculture have been held since 2007.

The topics of CCTA 2015 covered the theory and applications of all kinds of technology in agriculture, including: intelligent sensing, monitoring, and automatic control technology models; the key technology and model of the Internet of Things; agricultural intelligent equipment technology; computer vision; computer graphics and virtual reality; computer simulation, optimization, and modeling; cloud computing and agricultural applications; agricultural big data; decision support systems and expert system; 3s technology and precision agriculture; the quality and safety of agricultural

products; detection and tracing technology; and agricultural electronic commerce technology.

We selected the 122 best papers among the 237 papers submitted to CCTA 2015 for these proceedings. All papers underwent two reviews by two Program Committee members, who are from the Special Interest Group on Advanced Information Processing in Agriculture (AIPA), IFIP. In these proceedings, creative thoughts and inspirations can be discovered, discussed, and disseminated. It is always exciting to have experts, professionals, and scholars with creative contributions getting together to share inspiring ideas and accomplish great developments in the field.

I would like to express my sincere thanks to all authors who submitted research papers to the conference. Finally, I would also like to express my gratitude to all speakers, session chairs, and attendees, both national and international, for their active participation and support of this conference.

September 2016

Daoliang Li

# **Conference Organization**

## **Organizers**

China Agricultural University  
China National Engineering Research Center for Information Technology  
in Agriculture (NERCITA)  
Agricultural Information Institute of Chinese Academy of Agricultural Sciences  
(AIICAAS)  
China National Engineering Research Center of Intelligent Equipment for Agriculture  
(NERCIEA)  
International Federation for Information Processing (IFIP)  
Chinese Society of Agricultural Engineering (CSAE)  
Chinese Society for Agricultural Machinery (CSAM)  
Chinese Association for Artificial Intelligence (CAAI)  
Information Technology Association of China Agro-technological Extension Association  
Beijing Technology Innovation Strategic Alliance for Intelligence Internet Of Things  
Industry in Agriculture  
Beijing Society for Information Technology in Agriculture, China (BSITA)  
Group of Agri-Informatics, Ministry of Agriculture, China  
Sino-US Agricultural Aviation Cooperative Technology Center

## **Sponsors**

National Natural Science Foundation of China (NSFC)  
Ministry of Agriculture, China (MOA)  
Ministry of Science and Technology, China (MOST)  
Ministry of Industry and Information Technology, China (MIIT)  
State Administration of Foreign Experts Affairs, China (SAFEA)  
Beijing Administration of Foreign Experts Affairs, China  
Beijing Municipal Science & Technology Commission (BMSTC)  
Beijing Natural Science Foundation, China (BNSF)  
Beijing Association for Science and Technology, China (BAST)  
Beijing Academy of Agriculture and Forestry Sciences, China (BAAFS)  
Dabeinong Education Foundation, China  
The Global Forum on Agricultural Research (GFAR)

## Organizing Committee

Chunjiang Zhao	China National Engineering Research Center for Information Technology in Agriculture
Daoliang Li	College of Information and Electrical Engineering, China Agricultural University
Ajit Maru	Global Forum on Agricultural Research
Walter H. Mayer	PROGIS Software GmbH
Nick Sigrimis	Department of Agricultural Engineering, Agricultural University of Athens, Greece
Yubin Lan	Texas A&M University, USA
Liping Chen	China National Engineering Research Center of Intelligent Equipment for Agriculture
Xinting Yang	China National Engineering Research Center for Information Technology in Agriculture
Xianxue Meng	Agricultural Information Institute of Chinese Academy of Agricultural Sciences (CAAS)

## Chairs

Daoliang Li  
Chunjiang Zhao

## Conference Secretariat

Xia Li  
Fangxu Zhu  
Jieying Bi

## Contents – Part II

Effects of Waterlogging and Shading at Jointing and Grain-Filling Stages on Yield Components of Winter Wheat . . . . .	1
<i>Yang Liu, Chunlin Shi, Shouli Xuan, Xiufang Wei, Yongle Shi, and Zongqiang Luo</i>	
The Measurement of Fish Size by Machine Vision - A Review . . . . .	15
<i>Mingming Hao, Helong Yu, and Daoliang Li</i>	
Study on Growth Regularity of <i>Bacillus Cereus</i> Based on FTIR . . . . .	33
<i>Yang Liu, Ruokui Chang, Yong Wei, Yuanhong Wang, and Zizhu Zhao</i>	
Soybean Extraction of Brazil Typical Regions Based on Landsat8 Images . . . . .	41
<i>Kejian Shen, Xue Han, Haijun Wang, and Weijie Jiao</i>	
Study on Landscape Sensitivity and Diversity Analysis in Yucheng City . . . . .	48
<i>Xuexia Yuan, Yujian Yang, and Yong Zhang</i>	
Application and Implementation of Private Cloud in Agriculture Sensory Data Platform . . . . .	60
<i>Shuwen Jiang, Tian'en Chen, and Jing Dong</i>	
Analysis of Differences in Wheat Infected with Powdery Mildew Based on Fluorescence Imaging System . . . . .	68
<i>Shizhou Du, Qinhong Liao, Chengfu Cao, Yuqiang Qiao, Wei Li, Xiangqian Zhang, Huan Chen, and Zhu Zhao</i>	
Research on Video Image Recognition Technology of Maize Disease Based on the Fusion of Genetic Algorithm and Simulink Platform . . . . .	76
<i>Liying Cao, Ying Meng, Jian Lu, and Guifen Chen</i>	
The Design and Implementation of Online Identification of CAPTCHA Based on the Knowledge Base . . . . .	92
<i>Yu'e Song, Chengguo Wang, Ling Zhu, Xiaofeng Chen, and Qiyu Zhang</i>	
Research and Application of Monitoring and Simulating System of Soil Moisture Based on Three-Dimensional GIS . . . . .	100
<i>Guifen Chen, Jian Lu, Ying Meng, Liying Cao, and Li Ma</i>	
Colorimetric Detection of Mercury in Aqueous Media Based on Reaction with Dithizone . . . . .	111
<i>Zihan Wu, Ming Sun, and Ling Zou</i>	

Study on the Prediction Model Based on a Portable Soil TN Detector . . . . .	117
<i>Xiaofei An, Guangwei Wu, Jianjun Dong, Jianhua Guo,     and Zhijun Meng</i>	
A Research on the Task Expression in Pomology Information Retrieval . . . . .	127
<i>Dingfeng Wu, Jian Wang, Guomin Zhou, and Hua Zhao</i>	
Prediction of the Natural Environmental High Temperature Influences on Mid-Season Rice Seed Setting Rate in the Middle-Lower Yangtze River Valley . . . . .	133
<i>Shouli Xuan, Chunlin Shi, Yang Liu, Yanhua Zhao, Wenyu Zhang,     Hongxin Cao, and Changying Xue</i>	
Study on the Mutton Freshness Using Multivariate Analysis Based on Texture Characteristics . . . . .	143
<i>Xiaojing Tian, Jun Wang, Jutian Yang, Shien Chen, and Zhongren Ma</i>	
Research and Application on Protected Vegetables Early Warning and Control of Mobile Client System . . . . .	155
<i>Guogang Zhao, Haiye Yu, Lianjun Yu, Guowei Wang, Yuanyuan Sui,     Lei Zhang, Linlin Wang, and Jiao Yang</i>	
The Study of Winter Wheat Biomass Estimation Model Based on Hyperspectral Remote Sensing . . . . .	163
<i>Xiaowei Teng, Yansheng Dong, and Lumin Meng</i>	
Design and Implementation of TD-LTE-Based Real-Time Monitoring System for Greenhouse Environment Temperature . . . . .	170
<i>Xin Zhao, Yang Jiao, Lianjun Yu, and Chuanhong Zhang</i>	
Research and Design of LVS Cluster Technology in Agricultural Environment Information Acquisition System . . . . .	178
<i>Guogang Zhao, Haiye Yu, Lianjun Yu, Guowei Wang, Yuanyuan Sui,     and Lei Zhang</i>	
Information Acquisition for Farmland Soil Carbon Sink Impact Factors Based on ZigBee Wireless Network . . . . .	185
<i>Bingbing Wang, Dekun Zhai, Lijuan Sun, Dandan Yang, Zhihong Liu,     and Qiulan Wu</i>	
Penetration Depth of Near-Infrared Light in Small, Thin-Skin Watermelon . . .	194
<i>Man Qian, Qingyan Wang, Liping Chen, Wenqian Huang,     Shuxiang Fan, and Baohua Zhang</i>	
Design and Implementation of an Automatic Grading System of Diced Potatoes Based on Machine Vision . . . . .	202
<i>Chaopeng Wang, Wenqian Huang, Baohua Zhang, Jingjing Yang,     Man Qian, Shuxiang Fan, and Liping Chen</i>	

A Soil Water Simulation Model for Wheat Field with Temporary Ditches . . . . .	217
<i>Chunlin Shi, Yang Liu, Shouli Xuan, and Zhiqing Jin</i>	
The Synchronized Updating Technology Research of Spatio-temporal Supervision Data Model About Organizing of Construction Landuse Data in Distributed Environment . . . . .	225
<i>Xiaolan Li, Bingbo Gao, Yuchun Pan, Yanbing Zhou, and Xingyao Hao</i>	
Comparison of Four Types of Raman Spectroscopy for Noninvasive Determination of Carotenoids in Agricultural Products . . . . .	237
<i>Chen Liu, Qingyan Wang, Wengqian Huang, Liping Chen, Baohua Zhang, and Shuxiang Fan</i>	
The Molecular Detection of <i>Corynespora cassiicola</i> on Cucumber by PCR Assay Using DNAMAN Software and NCBI . . . . .	248
<i>Weiqing Wang</i>	
Simulation of Winter Wheat Phenology in Beijing Area with DSSAT-CERES Model . . . . .	259
<i>Haikuan Feng, Zhenhai Li, Peng He, Xiuliang Jin, Guijun Yang, Haiyang Yu, and Fuqin Yang</i>	
Design of Monitoring System for Aquaculture Environment . . . . .	269
<i>Hua Liu, Liangbing Sa, Yong Wei, Wuji Huang, and Binjie Shi</i>	
Research on the Agricultural Skills Training Based on the Motion-Sensing Technology of the Leap Motion . . . . .	277
<i>Peng-fei Zhao, Tian-en Chen, Wei Wang, and Fang-yi Chen</i>	
Study of Spatio-temporal Variation of Soil Nutrients in Paddy Rice Planting Farm . . . . .	287
<i>Cong Wang, Tianen Chen, Jing Dong, Shuwen Jiang, and Chao Li</i>	
Path Planning Methods for Auto-Guided Rice-Transplanters . . . . .	300
<i>Fangming Zhang, Changhuai Lv, Jie Yang, Caiyu Zhang, Guisen Li, and Licheng Fu</i>	
Research of the Early Warning Model of Grape Disease and Insect Based on Rough Neural Network . . . . .	310
<i>Dengwei Wang, Tian'en Chen, Chi Zhang, Li Gao, and Li Jiang</i>	
Evaluation Model of Tea Industry Information Service Quality . . . . .	320
<i>Xiaohui Shi and Tian'en Chen</i>	
Recognition and Localization Method of Overlapping Apples for Apple Harvesting Robot . . . . .	330
<i>Tian Shen, Dean Zhao, Weikuan Jia, and Yu Chen</i>	

Retrieval Methods of Natural Language Based on Automatic Indexing . . . . .	346
<i>Dan Wang, Xiaorong Yang, Jian Ma, and Liping Zhang</i>	
Improving Agricultural Information and Knowledge Transfer in Cambodia - Adopting Chinese Experience in Using Mobile Internet Technologies . . . . .	357
<i>Yanan Hu, Yun Zhang, and Yanqing Duan</i>	
Principal Component Analysis Method-Based Research on Agricultural Science and Technology Website Evaluation . . . . .	369
<i>Jian Ma</i>	
The Countermeasures of Carrying on Web of the Research Institutions in the Era of Big Data — Consider the Web of Chinese Academy of Agricultural Sciences . . . . .	382
<i>Liping Zhang</i>	
The Knowledge Structure and Core Journals Analysis of Crop Science Based on Mapping Knowledge Domains . . . . .	392
<i>Minjuan Liu, Lu Chen, Xue Yuan, Ting Wang, Yun Yan, and Yuefei Wang</i>	
Application of Spatial Reasoning in Predicting Rainfall Situation for Two Disjoint Areas . . . . .	404
<i>Jian Li, Yanbo Huang, Rujing Yao, and Yuanyuan Zhang</i>	
Simplifying Calculation of Graph Similarity Through Matrices . . . . .	417
<i>Xu Wang, Jihong Ouyang, and Guifen Chen</i>	
A Systematic Method for Quantitative Diameter Analysis of Sprayed Pesticide Droplets . . . . .	429
<i>Wei Ma, Xiu Wang, Lijun Qi, and Yanbo Huang</i>	
Development of Variable Rate System for Disinfection Based on Injection Technique . . . . .	437
<i>Wei Ma, Xiu Wang, Lijun Qi, and Wei Zou</i>	
Establishment and Optimization of Model for Detecting Epidermal Thickness in Newhall Navel Orange . . . . .	445
<i>Yande Liu, Yifan Li, and Zhiyuan Gong</i>	
Design and Implementation of Greenhouse Remote Monitoring System Based on 4G and Virtual Network . . . . .	455
<i>Guogang Zhao, Yu Lianjun, Haiye Yu, Guowei Wang, Yuanyuan Sui, and Lei Zhang</i>	
The Study of Farmers' Information Perceived Risk in China . . . . .	463
<i>Jingjing Zhang</i>	

Dynamic Changes of Transverse Diameter of Cucumber Fruit in Solar Greenhouse Based on No Damage Monitoring . . . . .	469
<i>Ruijiang Wei, Xin Wang, and Huiqin Zhu</i>	
Study on Laos-China Cross-Border Regional Economic Cooperation Based on Symbiosis Theory: A Case of Construction of Laos Savan Water Economic Zone. . . . .	479
<i>Sisavath Thiravong, Jingrong Xu, and Qin Jing</i>	
Study on Mode of Laos-China Cross-Border Collaboration Strategy Facing Symbiosis Relation . . . . .	487
<i>Sisavath Thiravong, Jingrong Xu, and Qin Jing</i>	
Research of Fractal Compression Algorithm Taking Details in Consideration in Agriculture Plant Disease and Insect Pests Image . . . . .	496
<i>Qiao Deng, Chunhong Liu, and Liting Fu</i>	
Commentary on Application of Data Mining in Fruit Quality Evaluation . . . . .	505
<i>Jinjian Hou, Dong Wang, Wenshen Jia, and Ligang Pan</i>	
Study on Identification of <i>Bacillus cereus</i> in Milk Based on Two-Dimensional Correlation Infrared Spectroscopy . . . . .	514
<i>Zizhu Zhao, Ruokui Chang, Yong Wei, Yuanhong Wang, and Haiyun Wu</i>	
Stimulating Effect of Low-Temperature Plasma (LTP) on the Germination Rate and Vigor of Alfalfa Seed ( <i>Medicago Sativa L.</i> ) . . . . .	522
<i>Xin Tang, Fengchen Liang, Lijing Zhao, Lili Zhang, Jing Shu, Huamei Zheng, Xu Qin, Changyong Shao, Jinkui Feng, and Keshuang Du</i>	
Evaluation of Timber and Carbon Sequestration Income of Cunninghamia Lanceolata Timber Forest and Management Decision Support. . . . .	530
<i>Yan Qi, Baoguo Wu, and Shanghong Li</i>	
Researches on the Variations of Greenhouse Gas Exchange Flux at Water Surface Nearby the Small Hydropower Station of Qingshui River, Guizhou . . . . .	539
<i>Lei Han, Xuyin Yuan, Jizhou Li, Yun Zhao, Zhijie Ma, and Jing Qin</i>	
The Application of Internet of Things in Pig Breeding. . . . .	548
<i>Minghua Shang, Gang Dong, Yuanjie Mu, Fujun Wang, and Huaijun Ruan</i>	
Research and Exploration of Rural and Agricultural Information Service – Taking Shandong Province as a Case . . . . .	557
<i>Jia Zhao, Jianfei Wang, and Wenjie Feng</i>	
Research on Agricultural Development Based on “Internet +” . . . . .	563
<i>Wenjie Feng, Lei Wang, Jia Zhao, and Huaijun Ruan</i>	

Research and Design of Shandong Province Animal Epidemic Prevention System Based on GIS . . . . .	570
<i>Jiabo Sun, Wenjie Feng, Xiaoyan Zhang, Luyan Niu, and Yanzhong Liu</i>	
Research and Design of Wireless Sensor Middleware Based on STM32. . . . .	579
<i>Jiye Zheng, Fengyun Wang, and Lei Wang</i>	
Technical Efficiency and Traceability Information Transfer: Evidence from Grape Producers of Four Provinces in China. . . . .	586
<i>Lei Deng, Ruimei Wang, Weisong Mu, and Jingjie Zhao</i>	
Erratum to: The Molecular Detection of <i>Corynespora Cassiicola</i> on Cucumber by PCR Assay Using DNAMan Software and NCBI . . . . .	E1
<i>Weiqing Wang</i>	
<b>Author Index . . . . .</b>	<b>595</b>

## Contents – Part I

The Growth Analysis in the Wheat Filling Process of the Two Hybrids and Their Parents Based on Richards Equation . . . . .	1
<i>Weiqing Wang</i>	
Comparative Study on Metaheuristic-Based Feature Selection for Cotton Foreign Fibers Recognition . . . . .	8
<i>Xuehua Zhao, Xueyan Liu, Daoliang Li, Huijing Chen, Shuangyin Liu,     Xinbin Yang, Shaobin Zhan, and Wenyong Zhao</i>	
Beta Function Law to Model the Dynamics of Fruit's Growth Rate in Tomato: Parameter Estimation and Evaluation . . . . .	19
<i>Qiaoxue Dong, Lili Yang, Mei Qu, Qinglan Shi, and Shangfeng Du</i>	
A Web-Based Cooperation and Retrieval Model of Character Images for Ancient Chinese Character Research. . . . .	27
<i>Xuedong Tian, Songqiang Yang, Xuesha Jia, Fang Yang,     and Chong Zhang</i>	
Research of Large-Scale and Complex Agricultural Data Classification Algorithms Based on the Spatial Variability . . . . .	45
<i>Hang Chen, Guifen Chen, Lixia Cai, and Yuqin Yang</i>	
An Algorithm for the Interactive Calculating of Wheat Plant Surface Point Coordinates Based on Point Cloud Model . . . . .	53
<i>Lei Xi, Guang Zheng, Yanna Ren, and Xinming Ma</i>	
Quick and Automatic Generation Method for the Evaluation Report of the Small Hydropower Substitute Fuel Project . . . . .	64
<i>Yingyi Chen, Jian Xue, Huihui Yu, Jing Xu, Zhumi Zhen, Xingyue Tu,     Zhijie Ma, Yun Zhao, and Yanzhong Liu</i>	
Aquaculture Access Control Model in Intelligent Monitoring and Management System Based on Group/Role . . . . .	72
<i>Qiyu Zhang, Yingyi Chen, Zhumi Zhen, Jing Xu, Ling Zhu,     Liangliang Gao, and Yanzhong Liu</i>	
A Decision Model Forlive Pig Feeding Selection . . . . .	82
<i>Xinxin Sun, Longqing Sun, and Yiyang Li</i>	
Study on Methods of Extracting New Construction Land Information Based on SPOT6 . . . . .	94
<i>Lei Guo, Dongling Zhao, Rui Zhang, Meng Du, Zhixiao Li, Xiang Wang,     and Yaru Wang</i>	

Application of Remote Sensing Technology in Agriculture of the USA . . . . .	107
<i>Yuechen Liu and Weijie Jiao</i>	
Aquatic Animal Disease Diagnosis System Based on Android . . . . .	115
<i>Min Sun and Daoliang Li</i>	
Relationship Between Vegetation Coverage and Rural Settlements and Anti-desertification Strategies in Horqin Left Back Banner, Inner Mongolia, China . . . . .	125
<i>Jian Zhou, Fengrong Zhang, Yan Xu, Yang Gao, and Xiaoyu Zhao</i>	
China Topsoil Stripping Suitability Evaluation Based on Soil Properties . . . . .	143
<i>Yan Xu, Yuepeng Wang, Xing Liu, Dan Luo, and Hongman Liu</i>	
Design of Corn Farmland Monitoring System Based on ZigBee . . . . .	153
<i>Xiuli Si, Guifen Chen, and Weiwei Li</i>	
Simulation of Winter Wheat Yield with WOFOST in County Scale. . . . .	161
<i>Shangjie Ma, Zhiyuan Pei, Yajuan He, Lianlin Wang, and Zhiping Ma</i>	
Predicting S&P500 Index Using Artificial Neural Network. . . . .	173
<i>Shanghong Li, Jiayu Zhang, and Yan Qi</i>	
The Extraction Algorithm of Crop Rows Line Based on Machine Vision . . . . .	190
<i>Zhihua Diao, Beibei Wu, Yuquan Wei, and Yuanyuan Wu</i>	
Design of High-Frequency Based Measuring Sensor for Grain Moisture Content . . . . .	197
<i>Qinglan Shi, Yunling Liu, and Wen Zhang</i>	
Propagation Characteristics of Radio Wave in Plastic Greenhouse . . . . .	208
<i>Jizhang Wang, Yuli Peng, and Pingping Li</i>	
A Review on Leaf Temperature Sensor: Measurement Methods and Application . . . . .	216
<i>Lu Yu, Wenli Wang, Xin Zhang, and Wengang Zheng</i>	
Distinguish Effect of Cu, Zn and Cd on Wheat's Growth Using Nondestructive and Rapid Minolta SPAD-502 . . . . .	231
<i>Jinheng Zhang, Yonghong Sun, Lusheng Zeng, Hui Wang,     Qingzeng Guo, Fangli Sun, Jianmei Chen, and Chaoyu Song</i>	
Small-Scale Soil Database of Jilin Province, China . . . . .	239
<i>Xiuli Si, Guifen Chen, and Weiwei Li</i>	
Agricultural Environmental Information Collection Device Based on Raspberry Pi . . . . .	246
<i>Baofeng Su, Linya Huang, Zhen Gao, and Jiao Guo</i>	

Design of Integrated Low-Power Irrigation Monitoring Terminal. . . . .	255
<i>Hongwu Tian, Mingfei Wang, and Jinlei Li</i>	
Non-destructive Detection of the pH Value of Cold Fresh Pork Using Hyperspectral Imaging Technique . . . . .	266
<i>Shanmei Liu, Ruifang Zhai, and Hui Peng</i>	
Cloud-Based Video Monitoring System Applied in Control of Diseases and Pests in Orchards . . . . .	275
<i>Xue Xia, Yun Qiu, Lin Hu, Jingchao Fan, Xiuming Guo, and Guomin Zhou</i>	
Research on Coordinated Development Between Animal Husbandry and Ecological Environment Protection in Australia. . . . .	285
<i>Yiming Zhu and Shasha Li</i>	
Determination of Lead (Pb) Content in Vetiver Grass Roots by Raman Spectroscopy . . . . .	292
<i>Yande Liu, Yuxiang Zhang, Lixia Jiang, and Haiyang Wang</i>	
Dynamic Analysis of Urban Landscape Patterns of Vegetation Coverage Based on Multi-temporal Landsat Dataset. . . . .	300
<i>Dong Liang, Ling Teng, Linsheng Huang, Xinhua Xie, Yan Zuo, and Jingling Zhao</i>	
The Application of the OPTICS Algorithm in the Maize Precise Fertilization Decision-Making. . . . .	317
<i>Guowei Wang, Yu Chen, Jian Li, and Yunpeng Hao</i>	
The Methodology of Monitoring Crops with Remote Sensing at the National Scale . . . . .	325
<i>Quan Wu, Li Sun, Yajuan He, Fei Wang, Danqiong Wang, Weijie Jiao, Haijun Wang, and Xue Han</i>	
Is Time Series Smoothing Function Necessary for Crop Mapping? — Evidence from Spectral Angle Mapper After Empirical Analysis. . . . .	335
<i>Ailian Chen, Hu Zhao, and Zhiyuan Pei</i>	
Application Feasibility Analysis of Precision Agriculture in Equipment for Controlled Traffic Farming System: A Review. . . . .	348
<i>Caiyun Lu, Zhijun Meng, Xiu Wang, Guangwei Wu, Nana Gao, and Jianjun Dong</i>	
Accurate Inference of Rice Biomass Based on Support Vector Machine. . . . .	356
<i>Lingfeng Duan, Wanneng Yang, Guoxing Chen, Lizhong Xiong, and Chenglong Huang</i>	

Brazil Soybean Area Estimation Based on Average Samples Change Rate of Two Years and Official Statistics of a Year Before . . . . .	366
<i>Kejian Shen, Weifang Li, Zhiyuan Pei, Fei Wang, Xiaoqian Zhang, Guannan Sun, Jiong You, Quan Wu, and Yuechen Liu</i>	
Meta-Synthetic Methodology: A New Way to Study Agricultural Rumor Intervention . . . . .	375
<i>Ruya Tian, Lei Wu, Yijun Liu, and Xuefu Zhang</i>	
Rapid Identification of Rice Varieties by Grain Shape and Yield-Related Features Combined with Multi-class SVM . . . . .	390
<i>Chenglong Huang, Lingbo Liu, Wanneng Yang, Lizhong Xiong, and Lingfeng Duan</i>	
The Acquisition of Kiwifruit Feature Point Coordinates Based on the Spatial Coordinates of Image . . . . .	399
<i>Bin Wang, Zixiao Chen, Jianmin Gao, Longsheng Fu, Baofeng Su, and Yongjie Cui</i>	
The Soil Nutrient Spatial Interpolation Algorithm Based on KNN and IDW . . . . .	412
<i>Xin Xu, Hua Yu, Guang Zheng, Hao Zhang, and Lei Xi</i>	
Segmentation of Cotton Leaves Based on Improved Watershed Algorithm . . . . .	425
<i>Chong Niu, Han Li, Yuguang Niu, Zengchan Zhou, Yunlong Bu, and Wengang Zheng</i>	
Research on Knowledge Base Construction of Agricultural Ontology Based on HNC Theory . . . . .	437
<i>Hao Xinning, Xie Nengfu, Sunwei, Zhong Xiaochun, and Zhang Xuefu</i>	
Method and System of Maize Hybridized Combination Based on Inbred SSR and Field Test . . . . .	446
<i>Zhe Liu, Zhenhong Zhang, Shaolong Fu, Xiaodong Zhang, Dehai Zhu, and Shaoming Li</i>	
Biomass-Based Leaf Curvilinear Model for Rapeseed ( <i>Brassica napus L.</i> ) . . . . .	459
<i>Wenyu Zhang, Weixin Zhang, Daokuo Ge, Hongxin Cao, Yan Liu, Kunya Fu, Chunhuan Feng, Weitao Chen, and Chuwei Song</i>	
Exploring the Effect Rules of Paddy Drying on a Deep Fixed-Bed . . . . .	473
<i>Danyang Wang, Chenghua Li, Benhua Zhang, and Ling Tong</i>	
Feature Extraction and Recognition Based on Machine Vision Application in Lotus Picking Robot . . . . .	485
<i>Shuping Tang, Dean Zhao, Weikuan Jia, Yu Chen, Wei Ji, and Chengzhi Ruan</i>	

Rapeseed ( <i>Brassica napus</i> L.) Primary Ramification Morphological Structural Model Based on Biomass . . . . .	502
<i>Weixin Zhang, Hongxin Cao, Wenyu Zhang, Yan Liu, Daokuo Ge, Chunhuan Feng, Weitao Chen, and Chuwei Song</i>	
Effective Wavelengths Selection of Hyperspectral Images of Plastic Films in Cotton . . . . .	519
<i>Hang Zhang, Xi Qiao, Zhenbo Li, and Daoliang Li</i>	
Research and Experiment on Precision Seeding Control System of Maize Planter . . . . .	528
<i>Nana Gao, Weiqiang Fu, Zhijun Meng, Xueli Wei, You Li, and Yue Cong</i>	
Study on Time and Space Prediction Model About Rice Yield in Hei Longjiang Province . . . . .	536
<i>Guowei Wang, Hongyan Hu, Hao Zhang, and Yu Chen</i>	
Research on the Digital Machine for Killing the Larva of Longicorn Beetle with Microwave Based on the Arduino . . . . .	546
<i>MingXi Shao, XiuMei Zhang, BingGuo Liu, ChangYong Shao, AiSheng Ma, ShouSheng Zhang, Sheng Liu, YuJie Liu, LiJing Zhao, and Lin Dong</i>	
Risk Assessment of Water Resources Shortage in Sanjiang Plain . . . . .	556
<i>Qiuixiang Jiang, Yongqi Cao, Ke Zhao, and Zhimei Zhou</i>	
Analysis of Soil Fertility Based on FUMF Algorithm . . . . .	564
<i>Hang Chen, Guifen Chen, Yating Hu, Liying Cao, Lixia Cai, and Sisi Yang</i>	
Modeling and Optimization of Agronomic Factors Influencing Yield and Profit of a Single-Cropping Rice Cultivar . . . . .	574
<i>Weiming Liu and Zuda Bao</i>	
The Milk Somatic Cell Image Segmentation Method Based on Dimension Reduction and Fusion . . . . .	580
<i>Jie Bai, Heru Xue, and Yanqing Zhou</i>	
Quantitative Detection of Pesticides Based on SERS and Gold Colloid . . . . .	587
<i>Yande Liu, Yuxiang Zhang, Haiyang Wang, and Bingbing He</i>	
Research on Freshwater Fish Information Service Mode for Modern Production and Circulation in the Internet + Era . . . . .	597
<i>Xinping Fang</i>	
Interactive Pruning Simulation of Apple Tree . . . . .	604
<i>Lili Yang, JiaFeng Chen, Jing Hua, MengZhen Kang, and QiaoXue Dong</i>	

Research on Key Technology of Grid Cell Division Method in Rural Community . . . . .	612
<i>Chunlei Shi and Bo Peng</i>	
A Review on Optical Measurement Method of Chemical Oxygen Demand in Water Bodies . . . . .	619
<i>Fei Liu, Peichao Zheng, Baichuan Huang, Xiande Zhao, Leizi Jiao, and Daming Dong</i>	
Analysis of Changes in Agronomic Parameters and Disease Index of Rapeseed Leaf Leukoplakia Based on Spectra. . . . .	637
<i>Kunya Fu, Hongxin Cao, Wenyu Zhang, Weixin Zhang, Daokuo Ge, Yan Liu, Chunhuan Feng, and Weitao Chen</i>	
<b>Author Index</b> . . . . .	655