# IFIP Advances in Information and Communication Technology

347

#### Editor-in-Chief

A. Joe Turner, Seneca, SC, USA

#### **Editorial Board**

Foundations of Computer Science

Mike Hinchey, Lero, Limerick, Ireland

Software: Theory and Practice

Bertrand Meyer, ETH Zurich, Switzerland

Education

Arthur Tatnall, Victoria University, Melbourne, Australia

**Information Technology Applications** 

Ronald Waxman, EDA Standards Consulting, Beachwood, OH, USA

Communication Systems

Guy Leduc, Université de Liège, Belgium

System Modeling and Optimization

Jacques Henry, Université de Bordeaux, France

**Information Systems** 

Jan Pries-Heje, Roskilde University, Denmark

Relationship between Computers and Society

Jackie Phahlamohlaka, CSIR, Pretoria, South Africa

Computer Systems Technology

Paolo Prinetto, Politecnico di Torino, Italy

Security and Privacy Protection in Information Processing Systems

Kai Rannenberg, Goethe University Frankfurt, Germany

Artificial Intelligence

Tharam Dillon, Curtin University, Bentley, Australia

**Human-Computer Interaction** 

Annelise Mark Pejtersen, Center of Cognitive Systems Engineering, Denmark

**Entertainment Computing** 

Ryohei Nakatsu, National University of Singapore

# 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. An umbrella organization for societies working in information processing, IFIP's aim is two-fold: to support information processing within its member countries and to encourage technology transfer to developing nations. As its mission statement clearly states,

IFIP's mission is to be the leading, truly international, apolitical organization which encourages and assists in the development, exploitation and application of information technology for the benefit of all people.

IFIP is a non-profitmaking organization, run almost solely by 2500 volunteers. It operates through a number of technical committees, which organize events and publications. IFIP's events range from an international congress to local seminars, but the most important are:

- The IFIP World Computer Congress, held every second year;
- Open conferences;
- Working conferences.

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 small and by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is less 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.

Any national society whose primary activity is in information may apply to become a full member of IFIP, although full membership is restricted to one society per country. Full members are entitled to vote at the annual General Assembly, National societies preferring a less committed involvement may apply for associate or corresponding membership. Associate members enjoy the same benefits as full members, but without voting rights. Corresponding members are not represented in IFIP bodies. Affiliated membership is open to non-national societies, and individual and honorary membership schemes are also offered.

# Computer and Computing Technologies in Agriculture IV

4th IFIP TC 12 Conference, CCTA 2010 Nanchang, China, October 22-25, 2010 Selected Papers, Part IV



#### Volume Editors

Daoliang Li Yingyi Chen China Agricultural University EU-China Center for Information & Communication Technologies (CICTA) 17 Tsinghua East Road, Beijing, 100083, P.R. China E-mail: {dliangl, chenyingyi}@cau.edu.cn

Yande Liu
East China Jiaotong University
College of Mechanical and Electronic Engineering
Shuanggang Road, Nanchang, 330013 Jiangxi, China
E-mail: jxliuyd@163.com

ISSN 1868-4238 e-ISSN 1868-422X ISBN 978-3-642-18368-3 e-ISBN 978-3-642-18369-0 DOI 10.1007/978-3-642-18369-0 Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2010942867

CR Subject Classification (1998): I.2.11, H.4, C.3, C.2, D.2, K.4.4

© IFIP International Federation for Information Processing 2011

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

The use of general descriptive names, registered names, trademarks, 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.

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

#### Preface

I want to express my sincere thanks to all authors who submitted research papers to the 4th IFIP International Conference on Computer and Computing Technologies in Agriculture and the 4th Symposium on Development of Rural Information (CCTA 2010) that were held in Nanchang, China, 22–25 October 2010.

This conference was hosted by CICTA (EU-China Centre for Information & Communication Technologies, China Agricultural University); China Agricultural University; China Society of Agricultural Engineering, China; International Federation for Information Processing (TC12); Beijing Society for Information Technology in Agriculture, China. It was organized by East China Jiaotong University.

CICTA focuses on research and development of advanced and practical technologies applied in agriculture and aims at promoting international communication and cooperation.

Sustainable agriculture is currently the focus of the whole world, and the application of information technology in agriculture has become more and more important. 'Informatized agriculture' has been the goal of many countries recently in order to scientifically manage agriculture to achieve low costs and high income.

The topics of CCTA 2010 covered a wide range of interesting theories and applications of information technology in agriculture, including simulation models and decision-support systems for agricultural production, agricultural product quality testing, traceability and e-commerce technology, the application of information and communication technology in agriculture, and universal information service technology and service systems development in rural areas. We selected 352 best papers among those submitted to CCTA 2010 for these proceedings. It is always exciting to have experts, professionals and scholars getting together with creative contributions and sharing inspiring ideas which will hopefully lead to great developments in these technologies.

Finally, I would like also to express my sincere thanks to all the authors, speakers, session chairs and attendees for their active participation and support of this conference.

October 2010 Daoliang Li

# Conference Organization

# Organizer

East China Jiaotong University

# Organizing Committee Chair

Yande Liu

## **Academic Committee Chair**

Daoliang Li

#### Conference Secretariat

Lingling Gao

# **Sponsors**

China Agricultural University China Society of Agricultural Engineering, China International Federation for Information Processing, Austria Beijing Society for Information Technology in Agriculture, China National Natural Science Foundation of China

# Table of Contents – Part IV

| Computation  | 1  |
|--|----|
| A Laplacian of Gaussian-Based Approach for Spot Detection in Two-Dimensional Gel Electrophoresis Images                            | 8  |
| A Leaf Layer Spectral Model for Estimating Protein Content of Wheat Grains   | 16 |
| A New Color Information Entropy Retrieval Method for Pathological Cell Image   | 30 |
| A New Palm-Print Image Feature Extraction Method Based on Wavelet Transform and Principal Component Analysis                       | 39 |
| A Non-linear Model of Nondestructive Estimation of Anthocyanin Content in Grapevine Leaves with Visible/Red-Infrared Hyperspectral | 47 |
| Application of Improved BP Neural Network in Controlling the Constant-Force Grinding Feed  | 63 |
| A Semantic Middleware of Grain Storage Internet  | 71 |
| AE Feature Analysis on Welding Crack Defects of HG70 Steel Used by Truck Crane   | 78 |
| An Equilateral Triangle Waveguide Beam Splitter  | 89 |
| Analysis and Implementation of Embedded SNMP Agent   | 96 |

| Application of Computer Technology in Advanced Material Science and Processing  | 103 |
|---|-----|
| Application of Interferometry in Ultrasonic System for Vibration  Zhengping Liu, Shenghang Xu, and Juanjuan Liu                       | 108 |
| Automatic Control System for Highway Tunnel Lighting  | 116 |
| Comparative Study of Distance Discriminant Analysis and Bp Neural Network for Identification of Rapeseed Cultivars Using Visible/Near |     |
| Infrared Spectra  | 124 |
| Current Situation and Prospect of Grassland Management Decision<br>Support Systems in China   | 134 |
| Qingwei Duan, Xiaoping Xin, Guixia Yang, Baorui Chen,<br>Hongbin Zhang, Yuchun Yan, Xu Wang, Baohui Zhang, and Gang Li                | 101 |
| Design Method and Implementation of Ternary Logic Optical Calculator  | 147 |
| Design of Automatic Cutting and Welding Machine for Brake Beam-Axle   | 167 |
| Design of Multifunction Vehicle Bus Controller  | 177 |
| Detection of Soil Total Nitrogen by Vis-SWNIR Spectroscopy  | 184 |
| Development and Application of Tennis Match Video Retrieval Technology in Multimedia Education  | 192 |
| Fault Diagnosis of Roller Bearing Based on PCA and Multi-class Support Vector Machine   | 198 |
| Health Status Identification of Connecting Rod Bearing Based on Support Vector Machine  | 206 |
| Investigation of the Methods for Tool Wear On-Line Monitoring during the Cutting Process  | 215 |

Sanmao Xie

| Study on Autonomous Path Planning by Mobile Robot for Road Nondestructive Testing Based on GPS     | 321 |
|--|-----|
| Study on Imitating Grinding of Two-Dimensional Ultrasonic Vibration Turning System                 | 333 |
| Study on Optimal Path Changing Tools in CNC Turret Typing Machine Based on Genetic Algorithm       | 345 |
| Study on the Problem and Countermeasure of Fruit Production Quality and Safety in Yanshan Mountain | 355 |
| Calculation and Analysis of Double-Axis Elliptical-Parabolic Compond Flexure Hinge                 | 361 |
| Surface Distresses Detection of Pavement Based on Digital Image Processing                         | 368 |
| The Application Research of Neural Network in Embedded Intelligent Detection                       | 376 |
| The Theoretical Analysis of Test Result's Errors for the Roller Type Automobile Brake Tester       | 382 |
| A Type of Arithmetic Labels about Circulating Ring   | 390 |
| Application of CPLD in Pulse Power for EDM   | 398 |
| Application of IDL and ENVI Redevelopment in Hyperspectral Image Preprocessing                     | 403 |
| Design of Integrated Error Compensating System for the Portable Flexible CMMs                      | 410 |
| Detecting and Analyzing System for the Vibration Comfort of Car<br>Seats Based on LabVIEW          | 420 |

Guangyao Xiong, Meizhu Zheng, Deying Li, Longzhi Zhao,

Yanlin Wang, and Minghui Li

514

| Test Analysis and Theoretical Calculation on Braking Distance of Automobile with ABS                    |
|---|
| The Detection of Early-Maturing Pear's Effective Acidity Based on Hyperspectral Imaging Technology      |
| The Effects of Internal and External Factors on the Mechanical Behavior of the Foam Copper              |
| Optimum Design of Runner System for Router Cover Based on Mold Flow Analysis Technology                 |
| Design of Tread Flange Injection Mold Based on Pro/E  |
| Study on the Online Control System to Prevent Drunk Driving Based on Photoelectric Detection Technology |
| The Design and Simulation of Electro-Hydraulic Velocity Control System                                  |
| Application of Background Information Database in Trend Change of Agricultural Land Area of Guangxi     |
| Reasons of the Incremental Information in the Updating Spatial Database                                 |
| Research on Non-point Source Pollution Based on Spatial Information Technology: A Case Study in Qingdao |
| The Regulation Analysis of Low-Carbon Orientation for China Land Use                                    |
| A CDMA-Based Soil-Quality Monitoring System for Mineland Reclamation                                    |

Jing Du, Daoliang Li, Hongwen Li, and Lifeng Shen

## XIV Table of Contents – Part IV

| Study on Evaluation Method for Chinese Agricultural Informatization   | 727 |
|---|-----|
| Research on Calculation Method for Agricultural Informatization Contribution Rate   | 735 |
| An Empirical Research on the Evaluation Index Regarding the Service Quality of Agricultural Information Websites in China | 742 |
| Hyperspectral Sensing Techniques Applied to Bio-masses Characterization: The Olive Husk Case                              | 751 |
| Author Index  | 765 |