The 4 th International Symposium on Computational Intelligence and Industrial Applications

第四届国际计算智能和工业应用研讨会论文集

Chief Editors:
XiaoYang Yu, Zhongming Luo, Deyun chen,
Yasufumi Takama,Huamin Yang,Guohun Zhu

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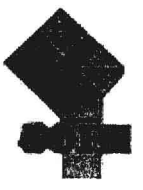


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内 容 简 介

近些年模糊系统、人工神经网络、演化计算等计算智能方法得到了突飞猛进的发展，并在很多领域得到成功应用。

本书是第四届国际计算智能和工业应用研讨会论文集，共收录了61篇优秀论文，分别从人工神经网络、模糊系统、进化计算、先进控制技术、图像处理、数据分析、数据挖掘、预测与预估、计算机技术和机器人与机电一体化等方面，阐述了当前国内外关于计算智能的最新发展趋势和研究成果，介绍了多种基于计算智能方法的工业应用实例，可以进一步促进计算智能方法的发展，为科研人员和工程技术人员提供新的解决问题的思路。

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Welcoming Message from Vice President of Harbin University of Science and Technology ISCIIA2010 General Chair

Ladies and gentlemen,

On behalf of the Harbin University of Science and Technology, it is my honor and pleasure to welcome you to Harbin, China and ISCIIA2010, the 4th International Symposium on Computational Intelligence and Industrial Application 2010.

At this biyearly conference, many groundbreaking papers about Advanced Technologies for Computational Intelligence and Industrial Applications will be presented. The success of this conference depends largely on the quality of the submissions and presentations. We hope that this conference will provide you with a great opportunity to exchange your experiences with other researchers and participants from different countries and regions.

Harbin, dubbed the Eastern Paris and the gem of a swan's necklace, is a beautiful city located in Heilongjiang province, northeast of China. There are many tourist attractions, such as Songhua River, Central Street, Dragon Tower, World heritage Wudalianchi and Changbai Mountain. It will be worth of your time to pay a visit to these sightseeing spots in leisure time. We hope you all not only attend a wonderful conference, but also enjoy a pleasant stay in Harbin.

We sincerely express our gratitude to authors and attendants for their contributions, the organizing and program committee members for their hard work, and plenary talk speakers to share their achievements.

Hong Zhao

Welcoming message from general chairs

Ladies and Gentlemen,

The 4th International Symposium on Computational Intelligence and Industrial Application 2010 is opened on August 2nd. On behalf of the organizing committee of ISCIIA2010, I'd like to express the warmest welcome to all the participants and spouses to Harbin, China.

Firstly, please allow me to review the successful history of ISCIIA. In 2004, the first Symposium of ISCIIA was held by Hainan University in Haikou, China. The second biyearly Symposium was organized by Guangdong Polytechnic Normal University in Guangzhou, China, followed by the 3rd Symposium in Dali, China. In the past two years, under kind concerns from the researchers and scientists, ISCIIA has gained more and more attentions from scientific and technical world, and played a vital role in the field of advanced knowledge exchange and high technique development. It has no doubt that the achievements of ISCIIA are quite favorable for both universities and industrial world. Now the 4th Symposium is being hosted by Harbin University of Science and Technology in Harbin, China.

Secondly, I am very proud to welcome our distinguished plenary speakers, namely Prof. Xiaoyang Yu and Dr. Guohui Yuan. Thank you for offering us a glorious kickoff. With your continuing contribution, ISCIIA will definitely grow and become a leading symposium in the field of soft computation.

Thirdly, I'd like to express the deep acknowledgement to the Committee Team of ISCIIA 2010: Deyun Chen, Jianying Fan, Jiangqiang Yi, Yasufumi Takama etc. And I also want to thank Prof.Kaoru Hirota, Prof.Shibin Zhao and Mr.Raymond Tay for your long-time disinterested contribution and assistance.

Last but not least, may we join together to devote more to develop Computational Intelligence and Industrial Application and wish a successful ISCIIA 2010 in Harbin.

General Chairs

Hong Zhao, Xinlao Wei, Xiaoyang Yu and Zhongming Luo

Greetings from Program Committee Chairs

Dear Authors,

Thank you very much for submitting papers to the 4th International Symposium on Computational Intelligence and Industrial Applications (ISCIIA2010).

For your contributions, we received more than 97 submitted papers. Each submission was reviewed by at least two referees. Paper contents were evaluated from the points of view of quality, originality, innovation, relevance to the conference, and presentation quality with five grades, i.e., excellent, good, average, poor, and unacceptable. Based on the peer-review results, only 61 papers have been accepted and published in this proceeding. Therefore, the acceptance rate is only about 64%.

Among the accepted papers, two best papers, three excellent papers, and two excellent student papers are chosen by the ISCIIA2010 committee. And about 18 papers will be further recommended to special issues of the Journal of Advanced Computational Intelligence and Intelligent Informatics (JACIII), and the Journal of Electric Machine and Control (JEMC). In addition, during this ISCIIA2010, each session will select one best session presenter. All best presenters will be awarded by the ISCIIA2010 committee.

We would like to thank the Program Committee for spending valuable time reviewing a lot of papers, and also thank session chairs for organizing the session for ISCIIA2010. Thank you again for your cooperation and participation to ISCIIA2010.

Program Committee Chairs
Deyun Chen, Yasufumi Takama and Jianqiang Yi

Plenary Talk (A)

Title: 3D Measurement Method and Technology Based on Combined Time Encoding Structured Light

By: Xiaoyang Yu, The higher educational key laboratory for Measuring & Control Technology and Instrumentations of Heilongjiang Province, HUST Harbin, Heilongjiang, 150040, China

The three-dimensional (3D) measurement technology of structured light has a board prospect for application in non-contact measurement of 3D visual effect with fantastic speed, high efficiency and low cost. The coding structured light measurement, renowned for high efficiency and easy identification has become the main development trend in the 3D measurement technology of structured light. Compared to space coding and direct coding, time coding has advantages of higher accuracy and sampling density, which contributes to the development direction of coding structured light technology. Thus, it is an eternal goal for the researchers to enhance comprehensive technical index like accuracy and sampling density while accelerating the speed. In this paper, the author mainly analyzes the 3D measurement methods and technology of the combined time coding structured light so as to improve accuracy and sampling density while ensuring measurement speed.

Basing on the systematically theoretical analysis of the traditional combined-cycle sinusoidal phase-shifting method, this paper at the outset, demonstrates combined-cycle method, which combines trapezoidal phase-shifting intensity ratio and trapezoidal phase-shifting. In addition, the complex arctangent operation is replaced by the simple arithmetic operation while ensuring the high sampling density in phase-shifting method. Therefore the calculating speed has been changed to merely ten percent of that in combined-cycle sinusoidal phase shift method, and it effectively improves the measurement speed.

Furthermore, the asymmetrical combined-cycle trapezoidal phase-shifting intensity ratio method is presented targeting for the error of one bit gray code and the periodic dislocation caused by measuring principle of the combined-cycle trapezoidal phase-shifting intensity ratio method. Then, through the combination of trapezoidal phase-shifting, the code yard of the encoding period and its corresponding location, one bit gray code error has been reduced to one bit intensity code error from cycling error which brings about elimination of periodic dislocation in principle and the improvement in measurement accuracy.

In order to improve the accuracy in decoding gray code, the author creatively proposes the adaptive threshold-belt binarization method, through sacrificing part of the sampling points with improving the accuracy of binarization and anti-jamming capability in the measurement.

Basing on the 3D MAX and the MATLAB environment, this research has established the 3D measurement emulation system, and completed the emulation system calibration. For a variety of typical three-dimensional surface, the author has adopted combined-cycled sinusoidal phase shift method, combined-cycled trapezoidal phase-shifting intensity ratio method and asymmetrical combined-cycled trapezoidal phase-shifting intensity ratio method to conduct emulation comparative experiments of three-dimensional measurement.

Then, the author designs and sets up experimental apparatus as well as its calibration equipment and completes calibration experiment of system. Meanwhile, asymmetrical combined-cycle trapezoidal phase-shifting intensity ratio method is used to three-dimensionally measure the typical surface and the

result has been verified.

Theoretical analysis and emulation result:

The result of reconstruction measured by combined-cycle sinusoidal phase-shifting method is confirmed with visual effect. And the plane maximum error is less than 2.304mm in the range from 700mm to 1000mm. But reconstructed plane and complex surface have periodic dislocation error. Compared with the former, symmetric combined-cycle trapezoidal phase-shifting intensity ratio method after the amendment dislocation causes the smooth surface with some small fluctuations. However, it eliminates the periodic dislocation error, and its maximum error is less than 0.753mm. In addition, the reconstruction surface is not smooth and even does not match with the measured object in vision. The reconstruction plane and complex surface used by asymmetric combined-cycle trapezoidal phase-shifting intensity ratio method is much smoother and less fluctuating and having no cycle dislocation error, and the plane maximum error is less than 0.514mm.

The apparatus measurement results:

It is shown that the maximal error of plane is less than 3mm in the range from 700mm to 1000mm, and the measuring accuracy is 0.3%. The 3D reconstruction method orienting structured light is used to reconstruct the measured object. And the result clearly illustrates that the measured surface and reconstruction result are commensurate in visual effect, and it can reflect the measured surface topography smoothly and carefully.

Plenary Talk (B)

Title: The Functionalities and Benefits of an Integrated Grid Optimization Solution

By: Guohui Yuan, Director of Product Management, CURRENT Group, USA

Abstract Text:

Voltage regulation and system efficiency are two of the most important issues facing today's utilities. First and foremost, utilities have the responsibility to keep the customers' delivered voltage within specified tolerances. Failing to do so can result in customer complaints and penalties. Secondly, utilities are increasingly obligated to meet energy efficiency goals that have been mandated by local, state, and central governments. Again, if they fail to act, they face non-recoverable penalties.

One of the central tasks of distribution system operation is voltage and VAR control. So far the most commonly used method of Volt/VAR control includes utilizing Load Tap Changers (LTCs) or regulators to regulate substation bus voltage and using locally controlled switched line capacitors to support feeder voltages and regulate VARs. However, the voltage and VAR controls are not coordinated, resulting in poor utilization of the distribution automation assets and suboptimal performance of the distribution grid.

This paper introduces an integrated centralized voltage and VAR control and optimization solution that consists of a system of software, communications, sensors, and grid control devices. CURRENT System Optimization, including Volt/VAR Control and Dynamic Voltage Optimization (DVO) software applications, collects real-time measurements from various sources such as capacitor banks, line voltage regulators, bellwether voltage sensors and substations. The software makes timely and optimal voltage and VAR control decisions, and automatically sends operation commands to capacitor banks, substation Load Tap Changers (LTC), and line voltage regulators.

In additional to maintaining optimal system power factor, the CURRENT System Optimization solution also provides an effective energy efficiency tool via automatic voltage reduction. By directly monitoring voltage closer to the customer using bellwether sensors, the system voltage can be regulated to a lower and narrower bandwidth (compared to traditional method) without violating regulatory limits, resulting in significant reductions in total energy consumptions.

CURRENT System Optimization solution has been deployed at Xcel Energy in Boulder as part of the Smart-Grid-City project. Since September 2008, CURRENT Group and Xcel Energy have worked closely together to implement a two-way centralized Volt/VAR control system in order to improve efficiency and reliability. In addition to power factor improvement, Xcel Energy also wants to be able to dispatch the line capacitors to meet system-wide HV delivery-point power factor requirements designed to minimize VAR impacts to the transmission system. The new Volt/VAR control system is currently under rigorous testing and evaluation.

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Chapter1

Interaction and Real-Time Applications with Multi-Media

Learning a Social Force Model for Pedestrian Motion Analysis from Image Sequences

Kazuhiko Kawamoto

Institute of Media and Information Technology Chiba University, Japan
kawa@faculty.chiba-u.jp

Abstract: we propose a method for recursively learning the parameters of a numerical simulation model for pedestrian motion using an image sequence. We construct the model with so-called social forces, which have been successfully used in computer simulations for pedestrian motion analysis. The contribution of this paper is to combine the numerical simulation model and observations captured from image sequences. To this end, we introduce the framework of data assimilation, which is originally developed in geosciences such as weather forecasting and hydrology for refining numerical simulation models using observations available in the real world. In addition we use a particle filter for the recursive Bayesian estimation In experiments with real videos we show a case study of pedestrian motion analysis.

Keywords: Pedestrian Motion Analysis, Social Force Model, Data Assimilation, Particle Filter

I Introduction

Pedestrian motion analysis has many potential applications in visual surveillance, active safety in intelligent transportation system, and escape simulation in public places such as subway and shopping malls, and so on. For pedestrian motion analysis, the most straightforward approach might be to build a dynamic model that mathematically describes pedestrian motion and to perform its numerical simulations in computers. In general, it is thought that it is difficult to build such a dynamic model because pedestrians have their own free wills and can freely take their own preferable routes in a space.

However, pedestrians are in fact affected by several factors when deciding their own routes. For example, one usually wants to keep a certain distance from other pedestrians. This fact suggests that a dynamic model can be described as a fluid dynamics based on Navier-Stokes or Boltzmann equations [1] by regarding pedestrians as gases and fluids. Such a model is called *macroscopic models*. Although the macroscopic approach can provide rigorous mathematical analysis of pedestrian motion, a variety of individual pedestrian motions cannot be well described, i.e., there is no distinction between individual pedestrians. For example, the pedestrians at the same place and time behave in the same fashion. As another approach, *microscopic models* [2][3] have been proposed and in the models individual pedestrians have their own parameters such as speeds and destinations.

In this paper we use a *social force* [2] based model to describe the motion of pedestrians and proposes a systematic framework of estimating the parameters of the model from an image sequence. To this end, we introduce the framework of *data assimilation*, which is originally developed in geosciences such as weather forecasting and