Studies in Computational Intelligence 566

Roger Lee *Editor*

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Studies in Computational Intelligence

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About this Series

The series "Studies in Computational Intelligence" (SCI) publishes new developments and advances in the various areas of computational intelligence—quickly and with a high quality. The intent is to cover the theory, applications, and design methods of computational intelligence, as embedded in the fields of engineering, computer science, physics and life sciences, as well as the methodologies behind them. The series contains monographs, lecture notes and edited volumes in computational intelligence spanning the areas of neural networks, connectionist systems, genetic algorithms, evolutionary computation, artificial intelligence, cellular automata, self-organizing systems, soft computing, fuzzy systems, and hybrid intelligent systems. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution, which enable both wide and rapid dissemination of research output.

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Foreword

The purpose of the 13th IEEE/ACIS International Conference on Computer and Information Science (ICIS 2014) held during June 4–6, 2014 in Taiyuan, China, was to gather researchers, scientists, engineers, industry practitioners, and students to discuss, encourage, and exchange new ideas, research results, and experiences on all aspects of Applied Computers and Information Technology, and to discuss the practical challenges encountered along the way and the solutions adopted to solve them. The conference organizers selected the best 14 papers from those papers accepted for presentation at the conference in order to publish them in this volume. The papers were chosen based on review scores submitted by members of the program committee and underwent further rigorous rounds of review.

In "A New Method of Breakpoint Connection for Human Skeleton Image," Xiaoping Li, Degui Zhao, Yongliang Hu, Ye Song, Na Fu, Qiongxin Liu present a new breakpoint algorithm based on layer and partition of the neighborhood. The algorithm scans skeleton images line by line. The number of other skeleton points is calculated for each skeleton point in its 8-neighborhood, then judges whether this skeleton point is a breakpoint or not according to the number of the above obtained and the distribution of other skeleton points in its 8-neighborhood.

In "Insult Detection in Social Network Comments Using Possibilistic Based Fusion Approach," Mohamed Maher Ben Ismail and Ouiem Bchir propose a novel approach to automatically detect verbal offense in social network comments. It relies on a local approach that adapts the fusion method to different regions of the feature space in ordêr to classify comments from social networks as insult or not. The proposed algorithm is formulated mathematically through the minimization of some objective function. It combines context identification and multi-algorithm fusion criteria into a joint objective function.

In "What Information in Software Historical Repositories Do We Need to Support Software Maintenance Tasks? An Approach Based on Topic Model," Xiaobing Sun, Bin Li, Yun Li, and Ying Chen propose a preprocess to facilitate selection of related SHR to support various software maintenance tasks. The preprocess uses the topic model to extract the related information from Software

Historical Repositories (SHR) to help support software maintenance, thus improving the effectiveness of traditional SHR-based technique. Empirical results show the effectiveness of this approach.

In "Evaluation Framework for the Dependability of Ubiquitous Learning Environment," Manel BenSassi and Mona Laroussi introduce a proposed framework to evaluate ubiquitous learning that treats the issue of considering contextual dimensions from a technological point of view. This framework is considered in the research interested in developing ubiquitous learning environments based on wireless and sensor technologies. Finally, they detail how they exploit this framework to evaluate a realistic case study.

In "Improving Content Recommendation in Social Streams via Interest Model," Junjie Zhang and Yongmei Lei implement three recommendation engines based on Sina Micro-blog and deploy them online to gather feedback from real users. Experimental results show that this method can recommend interesting information to users and improve the precision and stability of personalized information recommendation by 30 %.

In "Performance Evaluation of Unsupervised Learning Techniques for Intrusion Detection in Mobile Ad Hoc Networks," Binh Hy Dang and Wei Li demonstrate a research effort to evaluate the effectiveness and efficiency of different unsupervised detection techniques. Different types of experiments were conducted, with each experiment involving different parameters such as number of nodes, speed, pause time, among others. The proposed evaluation methodology provides empirical evidence on the choice of unsupervised learning algorithms, and could shed light on the future development of novel intrusion detection techniques for MANETs.

In "Live Migration Performance Modelling for Virtual Machines with Resizable Memory," Cho-Chin Lin, Zong-De Jian and Shyi-Tsong Wu present a general model for live migration. An effective strategy for optimizing the service downtime under this model is suggested. The performance of live migration is evaluated for virtual machines with resizable memory.

In "A Heuristic Algorithm for Workflow-Based Job Scheduling in Decentralized Distributed Systems with Heterogeneous Resources," Nasi Tantitharanukul, Juggapong Natwichai, and Pruet Boonma address the problem of job scheduling, so-called workflow-based job scheduling, in decentralized distributed systems with heterogeneous resources. As this problem is proven to be an NP-complete problem, an efficient heuristic algorithm to address this problem is proposed. The algorithm is based on an observation that the heterogeneity of resources can affect the execution time of scheduling. They compare the effectiveness and efficiency of the proposed algorithm with a baseline algorithm.

In "Novel Data Integrity Verification Schemes in Cloud Storage," Thanh Cuong Nguyen, Wenfeng Shen, Zhaokai Luo, Zhou Lei, and Weimin Xu propose two alternative schemes, called DIV-I and DIV-II, to verify that cloud data has not been illegally modified. Compared to S-PDP introduced by Ateniese et al., both DIV-I and DIV-II use less time to generate tags and verify. In addition, the proposed schemes fully support dynamic operations as well as public verification.

In "Generation of Assurance Cases For Medical Devices," Chung-Ling Lin and Wuwei Shen take the medical systems industry into account to illustrate how an assurance case can be generated when a software process is employed. In particular, we consider the Generic Insulin infusion Pump (GIIP) to show how an assurance case can be produced via a popular software development process, called Rational Unified Process (RUP).

In "A Survey on the Categories of Service Value/Quality/Satisfactory Factors," Yucong Duan, Nanjangud C. Narendra, Bo Hu, Donghong Li, Wenlong Feng, Wencai Du, and Junxing Lu work toward a solution for the missing factors in Service modeling standardization. They use the constructive process to classify the factors into more than 20 higher level categories with explanations on the process.

In "Effective Domain Modeling for Mobile Business AHMS (Adaptive Human Management Systems) Requirements," Haeng-Kon Kim and Roger Lee suggest a method that systematically defines, analyzes, and designs a domain to enhance reusability effectively in Mobile Business Domain Modeling (MBDM) in Adaptive Human Management Systems (AHMS) requirements phase.

In "A New Modified Elman Neural Network with Stable Learning Algorithms for Identification of Nonlinear Systems," Fatemeh Nejadmorad Moghanloo, Alireza Yazdizadeh, and Amir Pouresmael Janbaz Fomani propose a new dynamic neural network structure, based on the Elman Neural Network (ENN), for identification of nonlinear. Encouraging simulation results reveal that the idea of using the proposed structure for identification of nonlinear systems is feasible and very appealing.

In "A Simple Model for Evaluating Medical Treatment Options," Irosh Fernando, Frans Henskens, Masoud Talebian, and Martin Cohen introduce a model that is intuitive to clinicians for evaluating medication treatment options, and therefore has the advantage of engaging clinicians actively in a collaborative development of clinical Decision Support Systems (DSS).

It is our sincere hope that this volume provides stimulation and inspiration, and that it will be used as a foundation for works to come.

June 2014

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Contents

A New Method of Breakpoint Connection for Human Skeleton Image

Xiaoping Li, Degui Zhao, Yongliang Hu, Ye Song, Na Fu and Qiongxin Liu

Abstract There are many discontinuous skeleton points in human skeleton images, which make human skeleton behavior analysis be a difficult problem. Our paper presents a new breakpoint algorithm based on layer and partition of the neighborhood. We scan skeleton images line by line. The number of other skeleton points is calculated for each skeleton point in its 8-neighborhood. Then we judge whether this skeleton point is a breakpoint or not according to the number of the above-obtained and the distribution of other skeleton points in its 8-neighborhood. If it is, we will find available connection skeleton points which can connect the breakpoint. Finally, we find out the points that need to be updated to complete the breakpoint connection progress in accordance with linear equations established by the breakpoint and available connection points. Through of theory analysis and experiment verification, our method has good effect on connecting breakpoints in skeleton images and the shapes of skeleton images are undeformed. In addition to the human skeleton images, this method can also be used for other objects skeleton images on the breakpoints connection.

Keywords Breakpoint connection · Neighborhood · Skeleton image

1 Introduction

The behavioral status judgement of video object is not only applied in application fields such as video retrieval [1], intelligent national defense and public security [2], but also provided high value in a wide range of applications under extreme conditions

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and the environment which is difficult to observe, like the status judgement of extreme sports, the real-time analysis of astronauts' extravehicular behavioral status [3] and the locking of the military targets. However, there are so many types of monitoring video objects that have big discrepancies and different characteristics among them. So there is a need to choose a symbolic object as a representative for research. The human behavior analysis [4] has become the focus issue and representative research in the field of behavior recognition [5] because there are many features such as complexity, diversity and covering a wide range in human behavior. One of the important methods in human behavior analysis is to extract human body contour, skeleton the human body and at last use vector processing for the human skeleton model. The technology of modeling human skeleton can reduce amount of information needed to express the human body and retain the human behavioral characteristics at the same time. Existing skeleton modeling algorithm can be divided into three categories: the central axis conversion method [6], iterative morphological method [7] and ZS refinement [8]. Among these three categories of skeleton modeling algorithm, the first one is proposed earliest and the most well known. Both the Zhang-Suen thinning algorithm [9] proposed by Zhang and Fu and the Holt [10] thinning algorithm are belong to the second category. The third method mentioned above may lead to the location of nodes offset because it only deals with one side at a time. Due to the fact that some broken curves in the skeleton image [11] which is obtained by skeleton modeling algorithm, we can not locate the human skeleton key points and do human behavior analysis subsequently. That is to say connection of breakpoints plays a vital role in human behavior analysis.

Until now, many researchers devote themselves to this topic and propose several kinds of methods to try to solve the problem. The first is Method of the minimum value [12]: this method takes each breakpoint with the minimum distance or direction difference as its connection. It will make errors especially when the points are far away from each other. The second is Method of mathematical morphology [13]: this method repairs breakpoints by the basic operators like erosion, dilation, opening and closing. It is suitable for the simple situations but for the complex situations it works not so well. The last one is Method of graph search [14]: it builds a graph based on breakpoints and makes the best connections through graph search under the necessary physical rules. This method has very high time complexity.

Different with the methods of the above-mentioned, we present a method based on layer and partition of the neighborhood for discontinuous skeleton in this paper.

2 Image Preprocessing

For a human body movement image, we need to get the image of the human body contour using background subtraction method. For the contour image denoising, we use mathematical morphology such as opening and closing to preserve details and smooth non-impulsive noise. Then Otsu method [15] is applied to binarize the contour image. And next, central axis algorithm [16] and Holt algorithm are utilized

for image thinning. After the preprocessing, the skeleton image is composed of discrete fracture curves. So connection operation needs to be done subsequently for the existing breakpoints and extract the human contour completely.

3 Basic Elements

In this paper, we divide all the breakpoints to two types by the number of other skeleton points in the breakpoint's 8-neighborhood. The basic elements are explained below.

3.1 Neighborhood Layer

Each pixel has 8 neighboring pixels except boundary points in an image. They are called 8-neighborhood, which is named as the first neighborhood layer in our paper. And the second neighborhood layer consists of the next 16 nearest pixels which are called 16-neighborhood shown in Fig. 1. Like this, the third neighborhood layer includes 24 pixels and the N neighborhood layer has pixels of N multiplied by 8. The distributions of neighborhood layers are shown in Fig. 2. The same color points belong to a same neighborhood layer.

P1	P2	P3	P4	P5
P16				P6
P15		P		P7
P14				P8
P13	P12	P11	P10	P9

Fig. 1 16-Neighborhood of p point

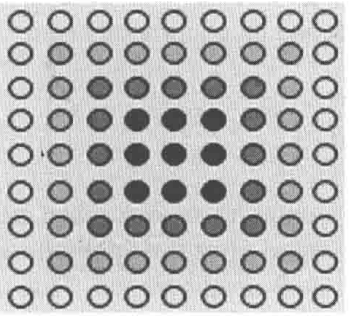

Fig. 2 Layers of neighborhood

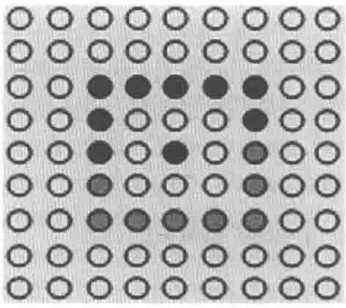

Fig. 3 *Upper left* and *lower right* neighborhood of the second neighborhood layer

3.2 Upper Left Neighborhood and Lower Right Neighborhood

In our paper, a neighborhood is divided into the upper left and lower right neighborhood according to a point is detected or not in the N neighborhood layer. If a point had been detected before, it belongs to the upper left neighborhood; otherwise, it is classified into the lower right neighborhood. The upper left and lower right neighborhood of the second neighborhood layer are shown in Fig. 3. The upper left neighborhood is consist of red points. So the green points belong to the lower right neighborhood.

3.3 Breakpoint Type

We classify all the breakpoints to two types according to the number of other skeleton points in the 8-neighborhood:

3.3.1 Isolated Point

When a skeleton point has no other skeleton points in its 8-neighborhood, this skeleton point is considered as an isolated point. Then if we try to find its available skeleton points for connection, we firstly need to search the upper left and lower right neighborhood of the second neighborhood layer.

3.3.2 Common Breakpoint

We call a breakpoint as a common breakpoint when the number of skeleton points is 1 in the upper left neighborhood of its 8-neighborhood and that of the lower right neighborhood equals to 0 in its 8-neighborhood. This time we only find the lower right neighborhood for available skeleton points in the second neighborhood layer.