Editor
Xiaodong Zhuang

Recent Advances on Computer Engineering

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Proceedings of the 14th International Conference on Applications of Computer Engineering (ACE '15)

Seoul, South Korea, September 5-7, 2015

Recent Advances in Computer Engineering Series | 33

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Preface

This year the 14th International Conference on Applications of Computer Engineering (ACE '15) was held in Seoul, South Korea, September 5-7, 2015. The conference provided a platform to discuss algorithms and theory of computation, artificial intelligence, computer networking, operating systems, mobile computing, software engineering, data mining etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Computer Guided Human Programming

Professor Eko Supriyanto
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Abstract: Human development is a response of education and environment to human body system. There are eight stages in the normal human development, which is baby (0-1 year old), toddler (1-3 years old), young children (3-5 years old), children (6-12 years old), adolescence (13-19 years old), young adulthood (20-40 years old), middle adulthood (40-60), and old adulthood (60-end of life). This includes the development of physical body (motoric and sensory), cognitive and knowledge, self-help and skill, social and emotional, and moral. Since human is time dependent DNA coded bioenergy symphony, the genetic, heredity, environment and health condition of organ system play important role in human development. It is well known that in the beginning of life, physical body including motoric system, sensory system and processing system growth very fast and becomes foundation of future human development. The right intervention to motoric system will create a strong and flexible body movement, intervention to sensory system will develop very sensitive environment response, whereas the excellent intervention to processing system will produce a knowledgeable cognitive system. Success in the intervention to these system, will provide a good platform for knowledge, skill, social, emotional and moral development. With considering health condition of human, it is possible to program human development to achieve certain purpose. Since ancient, the programming of human has been implemented in the normal daily life, this is however just partial programming and less interrelated. Many countries have developed and implemented a connected education system from toddler until young adulthood. This system is however also not focused on individual human development and not holistic approach. In this paper, a new model of human programming will be introduced. The programming is guided by computer which has function to collect, store, process and send data for human development assessment, analysis and intervention. The guidance system consist of human computer interface, databases and rules, which covers physical, cognitive and knowledge, self help and skill, social and emotional as well as moral development. Databases and rules for baby, toddler and young children have been completed and tested in the children development centre. Test result shows that this guidance system is very useful for children, parents and trainers to improve the ability of children according to given target. This system is also applicable for slow learner and Down syndrome children. For adulthood human, this system can be used to guide the career development, and assist human resources department for new staff hiring as well as help police department for criminal investigation.

Brief Biography of the Speaker: Eko Supriyanto is a Full Professor at the Faculty of Biosciences and Medical Engineering, Universiti Teknologi Malaysia. He is also a permanent Guest Professor at Faculty of Computer Science and Automation, Ilmenau University of Technology, Germany. He obtained his Doctor from Faculty of Electrical Engineering, University of Federal Armed Forces Hamburg, Germany. His research interest is application computer in education and healthcare. He has published more than 200 international journal / proceeding papers and obtained more than 30 international awards.

Plenary Lecture 2

Use of Bone-Conducted Speech for Speech Enhancement

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Abstract: In speech processing applications like hands-free communications, hearing aids and speech recognition, the technique of speech enhancement is often required. During the past few decades, significant progress has been made in the development of speech enhancement algorithms. Those algorithms accomplish the purpose of reducing noise, and as a result have been successfully used. However, in severely noisy environments, those algorithms introduce waveform distortion, resulting in that the intelligibility of the resulting speech is degraded. In this plenary speech, as an old but new technique for speech enhancement, bone-conducted speech is considered. The transmission of voice on bones is called bone conduction. When the voice waveforms are transmitted from the voice source (vocal cord) through the vocal tract wall and skull, they do not confront directly with noise. This is the reason why the bone-conducted speech signal can be utilized in a very noisy environment. However, it is known that the quality of bone-conducted speech is comparatively lower than that of normal speech being transmitted through air. This may be caused by the fact that the frequency components more than 1[kHz] deteriorate in bone-conducted speech. A straightforward method to improve the quality of bone-conducted speech is to emphasize the high frequency components of bone-conducted speech. However, this has been not accepted in many cases. One of the reasons may be that the phenomenon of bone conduction is speaker dependent. Thus, in this plenary speech, as a speaker-dependent technique, the use of an air- and bone-conduction integrated microphone is mainly discussed. Also, it is presented that the quality of bone-conducted speech can be significantly improved by combining adequately both the normal and bone-conducted speech signals. The goal of this kind of research is to obtain a clean speech signal even in highly noisy environments.

Brief Biography of the Speaker: Tetsuya Shimamura received the B.E., M.E., and Ph. D. degrees in electrical engineering from Keio University, Yokohama, Japan, in 1986, 1988, and 1991, respectively. In 1991, he joined Saitama University, Saitama City, Japan, where he is currently a Professor. During this, he joined Loughborough University, UK, and The Queen's University of Belfast, UK, in 1995 and 1996, respectively, as a visiting Professor. He is an author or co-author of six books, and a member of the organizing committee of several international conferences. His interests are in digital signal processing and its applications to speech, image and communication systems. He received a Gold Paper Award at IEEE Pacific Rim Conference on Communications, Computers and Signal Processing in 2011, and a Best Paper Award at WSEAS International Conference on Multimedia Systems and Signal Processing in 2013, respectively. He also received a Best Paper Award from Research Institute of Signal Processing Japan in 2013 and 2015.

Plenary Lecture 3

Synthetic Over-Sampling and Understandable Data Mining Models

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Abstract: Understandable data mining models like decision tree algorithms have the property that gives higher priority to the classes having more training instances with better purity for more accurate classification. Due to the property, data that belong to minority are often neglected. But, we often interested in these data. As a way to overcome the problem over-sampling has been considered a good technique for better classification of the minor class. Synthetic minority over-sampling technique supplies instances of a minor class to build better classification models for the minor class. But, if we build a data mining model using a training data set, some instances are classified wrongly. There are two reasons for the wrong classification--the limitation of the data mining algorithm itself, and imperfection of the data set itself. As a way to build better data mining for a minority class without sacrificing overall accuracy, we select good synthetic data instances for our data mining. By checking whether the synthetic data instances are classified correctly or not, and supplying the good ones only to build our target data mining model like decision tree, we could build better data mining model for a minor class. Several examples will be shown.

Brief Biography of the Speaker: Dr. Hyontai Sug: received BS degree in computer science and statistics from Busan National University, Korea in 1983, and MS degree in applied computer science from Hankuk University of Foreign Studies, Korea in 1986, majoring natural language processing, and Ph.D. degree in computer and information science and engineering from University of Florida, USA in 1998, majoring data mining. He was a researcher of Agency for Defense Development, Korea from 1986 to 1992, and a full-time lecturer of Pusan University of Foreign Studies, Korea from 1999 to 2001. Currently, he is professor of Dongseo University, Korea from 2001. He published several noticeable articles in the field of data mining, so that he has been listed in Marquis who's who in the world since 2006. His research interests include data mining especially in the field of decision trees and association rules, and he is also interested in database application development.

Plenary Lecture 4

Bio-Inspired Visual Information Processing and its Applications to DSM and ADAS

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Abstract: The physiological studies about visual cortex from the investigation of cat's striate cortex by Hubel and Wiesel have introduced the foundation knowledge about biological vision in the nature. The neuromorphic visual information processing method, inspired by Hubel and Wiesel's experiments, is proposed to replicate the performance of visual cortex in practical computing settings. By applying the orientation feature extraction and subsequently applying the neural network ensured robustness and accuracy. Considering the number of fatalities and serious injuries of road users, the safety enhancement has begun to gain more attention, in particular accurate and timely detection of the risk of accident with the focus on the drivers and other vulnerable road users, such as the pedestrians or cyclists. We have proposed that the neuromorphic visual processing algorithm based on the biological vision system is an effective approach for making detection of human figures from a moving vehicle. The effectiveness of neuromorphic vision has been evaluated for the vulnerable road users of cyclist or pedestrian detection via successful detection at either the day time or the night time. The post enhancement with deep networks shows that further applications of incorporating neuromorphic visual processing into Driver State Monitoring both for the purpose of enhancing vulnerable road users' safety and the extended human-machine interface of emotive detection. The early implementations have demonstrated the advantages of fast and robust neuromorphic vision with either the small embedded system based on Raspberry or the customized embedded system based on FPGA, while the neuromorphic ASIC based on Hodgkin-Huxley formalism was evaluated successfully based on the controlled CMOS conductance.
Our conclusion is that the neuromorphic vision mimicking of the visual cortex, coupled with neural networks, suggests it as the new smart and robust device of Drive State Monitoring and Advanced Driver Assistance System for the road safety enhancement.

Brief Biography of the Speaker: Prof. Il Song Han is an invited professor at the Graduate School for Green Transportation at Korea Advanced Institute of Science and Technology, and has significant experience in academia and industry. His research interests are in the areas of analogue-mixed VLSI design, wireless power transfer, neuromorphic device and vision system, bio-inspired neural networks VLSI, active safety technology for vulnerable road users and driver status monitoring. One of his neuromorphic vision research results has been adopted for the new safety device development by an automotive manufacturing industry.