Editors
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Recent Advances in Knowledge Engineering and Systems Science

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- *Proceedings of the 12th International Conference on Artificial Intelligence, Knowledge Engineering and Data Bases (AIKED '13)*
- *Proceedings of the 12th International Conference on Software Engineering, Parallel and Distributed Systems (SEPADS '13)*

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Recent Advances in Computer Engineering Series | 10

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Preface

This year the 12th International Conference on Artificial Intelligence, Knowledge Engineering and Data Bases (AIKED '13) and the 12th International Conference on Software Engineering, Parallel and Distributed Systems (SEPADS '13) were held in Cambridge, UK, February 20-22, 2013. The conferences provided a platform to discuss artificial intelligence, knowledge engineering and data bases, software engineering, PDS' architectures, PDS' software, PDS' algorithms and applications, other issues on PDS' and software engineering, algorithms etc with participants from all over the world, both from academia and from industry.

Their 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 these conferences 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 these 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

Table of Contents

Plenary Lecture 1

Socio-Cultural Evolution via Neighborhood-Restructuring in Intricate Multi-Layered Networks

Assistant Professor Mostafa Z. Ali
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Abstract: Over the last three decades, many algorithms have been introduced for solving optimization problems of various complexities. Due to the variability of the characteristics in different optimization problems, none of these algorithms performs consistently over a range of problems. Very often due to the lack of communication among researchers from Evolutionary Computation (EC) and other domains of science and engineering like computational electromagnetics, power systems, signal processing, computational chemistry, communication engineering and so on, the non-EC researchers try classical techniques on hard optimization problems and continue with poor results, which could have been substantially improved by applying an EC algorithm.
Previous work in the optimization field of practical problems had shown that cultural learning emerged as the result of meta-level swarming of knowledge sources. Cultural Algorithms employ a basic set of knowledge sources, each related to knowledge observed in various animal species. These knowledge sources are then combined to direct the decisions of the individual agents in solving optimization problems using an influence function inspired by the social fabric metaphor. This metaphor provides a framework in which the Knowledge Sources can access the social networks to which individuals can belong, where neighborhood topologies are typically random in terms of the spatial positions of connected neighbors.
We propose an approach that explores the use of a modified multi-layered social fabric with dynamic topologies. This approach is used to restructure the living informational skin created out of the engineered emergence of agents illustrating the tension between the individual and the community in a context of interaction between them. As a diversity preserving-measure, the graph of topology of agents in the formed networks is dynamically and periodically changed, during an algorithm run. The algorithm has been tested on a set of hard real-world problems. Our results suggest that under appropriate parameter settings, the use of the modified graphs of neighborhoods with a probabilistic disruptive re-structuring of the topology produces the best results on the considered test functions compared to the best known results of other algorithms from literature.

Brief Biography of the Speaker: Mostafa Z. Ali, received the Bachelor degree in Applied Mathematics at Jordan University of Science &Technology (JUST), Irbid, Jordan, in 2000. He finished his Masters in Computer Science at the University of Michigan-Dearborn, Michigan, USA in 2003. He finished his Ph.D. in computer science/Artificial Intelligence at Wayne State University, Michigan, USA in 2008.
He is an assistant professor at the department of computer information systems at Jordan University of Science & Technology, Irbid, Jordan. He has more than 36 publications in Journals, conference proceedings, and book chapters. His research interests include artificial intelligence, evolutionary computation, Cultural Algorithms, Virtual Reality, data mining, Bioinformatics Databases, Computer Graphics, and image processing.
Dr. Ali is a member of the IEEE, the IEEE computer society, the American Association of Artificial Intelligence (AAAI), and the ACM.

Plenary Lecture 2

Web Usage Mining and E-learning

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Abstract: There are several opportunities for checking and evaluating the level of students' work, knowledge acquisition and assessment within the framework of traditional classroom and laboratory sessions.
However, the situation is completely different in the case of e-learning. Seemingly there are not at all any tangible tools in one's hands whereby the process of knowledge acquisition or the fact whether students have understood or not the information to be learned could be checked. Problems of comprehension and, through those, the possible shortcomings or faults of the content or structure of the electronic syllabus can only be concluded from students' products (submitted tasks, test results). A further source of information comprises forum discussions and online conversations in this respect. Questionnaires are a frequently applied yet formal means of the exploration of learning difficulties or course evaluation. Interviews or case studies both seem appropriate methods, however, their application in great numbers appears to be quite time-consuming.
The above limitations and problems can be eliminated by the use of data mining methods. In an electronic learning environment the data of the student – learning object interaction are stored in a database on the server without anyone's knowledge. By the application of online and offline web mining algorithms and methods these databases may become „subject to inquiry". As a result, a lot of useful information may be gained as to tutoring, evaluating and developing courses.
Web mining methods allow us to draw conclusions about certain cognitive processes, strategies and learning specialities, as well as to determine and tipify particular learning habits and difficulties. Two cognitive maps are to be recognized of the context of syllabus-developer – electronic syllabus – student. To be more exact, two cognitive maps are collated. One of them has been conceived and created by the developer and the other one is the map as finally realized by the student. Their comparison enables the recognition of certain learning characteristics. The simpler a cognitive map is, the simpler its inner representation, or, the more complex it is, the more time it takes to understand and take note of. The simplest possible cognitive network which is repeated with all learning objects needs the least possible attention on the part of the student during navigation, therefore emphasis falls on the acquisition of information located in the clusters.
The web mining methods applied in the course of the examination were as follows:
- Frequency analysis: the download of syllabus elements shows how far students have got in processing the syllabus, which objects they use frequently or not at all.
- Sequence analysis: it serves the examination of students' click-series. It shows which objects students have visited in succession and how much time they have spent processing each.
- Cluster analysis: groups may be formed according to learning characteristics, which are appropriate for distinguishing student types, learning styles and strategies.
The following aspects of course development have been formulated through these examinations:
- The exact definition of learning objectives and requirements at the beginning of the course
- The establishment of the relation with prior knowledge
- The logical set up (modular set up by hierarchy and sequence) and exposition of the syllabus (highlighting the essence and dividing the object through screen design)
- Knowledge transfer through the manifold applications of the acquired skills during the course (several practice test handouts)
- Learning guidance, the promotion of the formation of a competent knowledge structure (eg. screen design, questions, animations, summaries)
- Raising and continuously maintaining attention, motivation through practical screen design, a varied set of media, a transparent navigation system, regular feedback and a permanent tutorial presence
- Involving students by a continuous allotment of tasks, the solution of self check tests and forum discussions

- The advocation of communal learning through tasks of collaboration and cooperation (eg. wiki, forum, glossary)
- The reproductive and productive application of the acquired material (the communal and later individual solution of tasks and problems)

Brief Biography of the Speaker: Prof. Dr. Imre J. Rudas graduated from Bánki Donát Polytechnic, Budapest in 1971 and received the Master Degree in Mathematics from the Eötvös Loránd University, Budapest while the Ph.D. in Robotics from the Hungarian Academy of Sciences in 1987. He is active as the President of Obuda University and as a professor of John von Neumann Faculty of Informatics.

Prof. Rudas is a Fellow of IEEE, Administrative Committee member of the Industrial Electronics Society, member of the International Board of the Robotics & Automation Society, Chairman of the joint Hungarian Chapter of these Societies, and RAS and IES Chapter Coordinator of Region 8. He is also a registered expert of the United Nations Industrial Development Organization and the EU.

He is the President of the Hungarian Fuzzy Association and Steering Committee Member of the Hungarian Robotics Association and the John von Neumann Computer Society.

Prof. Rudas serves as an associate editor of IEEE Transactions on Industrial Electronics, member of editorial board of Journal of Advanced Computational Intelligence and Control Engineering Practice, member of various national and international scientific committees. He is the founder of the IEEE International Conference Series on Intelligent Engineering Systems Prof. Rudas was the General Co-chair of ICAR2001, and also serves as General Chairman and Program Chairman of numerous scientific international conferences.

His present areas of research activity are: Robot Control, Soft Computing, Computed Aided Process Planning, Fuzzy Control and Fuzzy Sets. Prof. Rudas has published more than 280 papers in various journals and international conference proceedings.

Dr. Peter Toth is a professor of Trefort Ágoston Centre for Engineering Education at Obuda University, Hungary where he is participating in technical initial teacher training and in-service training courses. Currently he is a director of the Centre.

He earned his MSc in Engineering Education at the Budapest University of Technology and Economics, and Peter Toth has Ph.D degree in Educational Research from Eötvös Loránd University.

He plays leading role in planning, development and managing traditional and virtual engineering programs. Dr. Toth is doing research on pedagogy of virtual learning environment, improvement of problem-solving thinking and analyzing of spatial abilities in engineering education. His actual research area is analysis of students' activities and behavior in virtual learning environment by web mining methods.

He has been contributing in some European researches and projects on pedagogical aspects of e-learning and development of creativity and abilities of future engineers and teachers as well. He is member of Committee for Teacher Training of Hungarian Rectors' Conference and secretary of Informatics Section of Pedagogical Committee of Hungarian Academy of Sciences. Dr. Toth has issued about 60 papers in several journals and conference proceedings.

Plenary Lecture 3

Cuckoo Search Optimization Metaheuristic Adjustment

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Abstract: Hard optimization problems that cannot be solved within reasonable time by standard, mathematical, deterministic methods are of great practical interest. Metaheuristics inspired by nature were recently successfully used for such problems. These metaheuristics are based on random Monte-Carlo search guided by simulation of some nature intelligence, especially evolution and swarm intelligence. One of the latest swarm intelligence algorithms is the Cuckoo Search Algorithm which has not yet been investigated thoroughly. For all such nature inspired algorithms fundamental issue is balance between use of good found solutions (exploration) and investigation of new areas of the search space in order to avoid being trapped in local minima (exploration). Specific of the Cuckoo Search Algorithm is exploitation/exploration based on Lévi flight i.e. combination of short and long steps according to Lévi distribution with infinite mean and variance. This plenary lecture will concentrate on investigation of the Cuckoo Search Algorithm parameters adjustment and specifically sensitivity to Lévi distribution parameters.

Brief Biography of the Speaker: Milan Tuba is Professor of Computer Science and Provost for mathematical, natural and technical sciences at Megatrend University of Belgrade. He received B. S. in Mathematics, M. S. in Mathematics, M. S. in Computer Science, M. Ph. in Computer Science, Ph. D. in Computer Science from University of Belgrade and New York University. From 1983 to 1994 he was in the U.S.A. first as a graduate student and teaching and research assistant at Vanderbilt University in Nashville and Courant Institute of Mathematical Sciences, New York University and later as Assistant Professor of Electrical Engineering at Cooper Union Graduate School of Engineering, New York. During that time he was the founder and director of Microprocessor Lab and VLSI Lab, leader of scientific projects and supervisor of many theses. From 1994 he was Assistant Professor of Computer Science and Director of Computer Center at University of Belgrade, from 2001 Associate Professor, Faculty of Mathematics, and from 2004 also a Professor of Computer Science and Dean of the College of Computer Science, Megatrend University Belgrade. He was teaching more than 20 graduate and undergraduate courses, from VLSI Design and Computer Architecture to Computer Networks, Operating Systems, Image Processing, Calculus and Queuing Theory. His research interest includes mathematical, queuing theory and heuristic optimizations applied to computer networks, image processing and combinatorial problems. He is the author or coauthor of more than 130 scientific papers and coeditor or member of the editorial board or scientific committee of number of scientific journals and conferences. Member of the ACM since 1983, IEEE 1984, New York Academy of Sciences 1987, AMS 1995, WSEAS, SIAM, IFNA.

Plenary Lecture 4

Lexical Knowledge Representation

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Abstract: The presentation of Lexical Knowledge (LK) is a very important area of Natural Language Processing (NLP) which uses various approaches to model lexical information for different applications.
The traditional scheme for LK representation is given at the dictionaries where the context of a related headword is presented by giving its different meanings (possibly with sentence examples). Dictionaries can be presented also in computer-readable and computer-tractable ways by using the encodings and approaches for deep or shallow parsing, so to be processed by computers depending on the specific tasks.
At the same time, NLP applications require a more formal way of representation like formal grammars. We will give examples by using formal grammar theories, and particularly the DATR language for lexical knowledge representation to analyse both lexical and grammar knowledge representation approaches, which use semantic networks and inheritance type hierarchies. We will compare them with the related application of Universal Networking Language (UNL) lexical knowledge representation examples, which also use semantic networks.
Finally, we will discuss these approaches with respect to their machine translation use and application.

Brief Biography of the Speaker: Assist. Prof. Dr. Velislava Stoykova has received her MA degree from Sofia University. In 2004 she has received a PhD in computational linguistics and afterward, she is working active in the field. Her major areas of interest are: language modelling, natural language processing, computational lexicography, e-learning. From 1990 to 1995 she worked at the Bulgarian Academy of Sciences, Institute for Parallel Processing as a programmer. From 1995 to 2011 she joined the research team of the Institute for Bulgarian language at the Bulgarian Academy of Sciences as a researcher. From 2011 she works at the Bulgarian Academy of Sciences, Institute for Bulgarian language as an assistant professor.
Assist. Prof. Dr. Stoykova has one book, more than 30 published papers in international conference proceedings and scientific journals, and is a co-author of two dictionaries. She is a member of the research team at the Institute for Bulgarian Language. She had worked on many research projects (national and international) as a member of the research team and as a project leader. Assist. Prof. Dr. Stoykova is a member of Bulgarian Lexicographic Society and a member of Bulgarian Artificial Intelligence Association.

Plenary Lecture 5

Task Tree Executor: Evolution and Experience

Professor Miroslav Popovic
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Abstract: Task trees are important class of parallel programs that are found in a broad range of applications, from critical infrastructures such as electricity, oil, and gas distribution networks, to modern large-scale computer games. Nowadays there are many approaches to parallel programming of multicores supported by various parallel programming frameworks, which could serve the purpose, and covering them all in a single lecture would be hardly achievable. Therefore, in this lecture, I switch immediately to a particular kind of task trees that are created and executed by the runtime library named Task Tree Executor (TTE), with which I have a great pleasure to be involved in. It seems appropriate mentioning that the original motive to design and implement TTE was a real-world project with a goal to parallelize a huge FORTRAN package for a legacy electricity distribution management system, back in 2008. The central idea behind the TTE is rather simple: partition a system model, which takes a form of a graph, into a set of slices, and create the corresponding task tree by assigning a task to each slice; the resulting task tree then may be executed in parallel top-down and bottom-up in order to perform various system calculations, a.k.a. system functions. In the lecture, I cover the TTE architecture evolution, which happened in the four distinctive steps, over period 2008-2012, as well as the experience I gathered, mainly the objective results that were provided through the experiments. I will also talk about statistical testing of task trees, and results achieved in that area. Although the focus of the lecture is on a particular kind of parallel programs, the TTE approach should be applicable on a broader class of problems/systems, so that other researchers and practitioners may find inspiration for their own work in it.

Brief Biography of the Speaker: Miroslav V. Popovic was born in Novi Sad, Serbia on February 1, 1961. He received his M.Sc. degree in electrical engineering from the Faculty of technical sciences at the University of Novi Sad, Novi Sad, Serbia, in 1984, and his Ph.D. degree in electrical and computer engineering from the University of Novi Sad, Novi Sad, Serbia, in 1990. His major field of study was computer engineering. He started his career as an assistant professor at the Faculty of technical sciences, where he remained working to the present day. He was promoted to a lecturer (docent) in 1992 and to an associated professor in 1997. Finally, he was promoted to a tenured professor in 2002. He is currently the head of the Chair of computer engineering and can be reached at the University of Novi Sad, Faculty of technical sciences, Department of computing and control, Trg Dositeja Obradovica 6, 21000 Novi Sad, Serbia. He wrote the book Communication Protocol Engineering (Boca Raton, Florida, USA: CRC Press, 2006) and about 150 papers published in international and domestic journals and conference proceedings. His current research interests are in the areas of parallel programming, model-based development, testing, and verification. Prof. Popovic is the member of the program committee of the IEEE Annual Conference on Engineering of Computer Based Systems (ECBS), and also the member of IEEE, IEEE Computer Society, IEEE TC on ECBS, and ACM.

Plenary Lecture 6

Ontological Services Level Agreement (SLA) Model and Its Application in Cloud Computing Environment

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Abstract: Ontology is the key enabling power in realizing the full potential of service in cloud computing environment. It plays important roles in supporting the common tasks of resources cloud service or what we called as resoruce as a service (RaaS) which is being categories into several level components of services such as Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). In the context of cloud computing, ontological of services level agreement (SLA) has played an important features to enable sharing of resources of services between cloud service provider (CSP) and cloud service requester (CSR) in utilizing the RaaS. This application or utilization of SLA together with RaaS will be working based on their service of agreement as a contract which is involed both parties that to be decided towards benefitials impact of their business organization of the future. Therefore, there is a need of a model that focuses on ontological SLA which is related to RaaS that to become as a standard guidance to those who are involved in cloud computing enviroment. Furthermore, by describing all those features of categories of SLA or called as ontological of SLA, it will be covering of all aspects of services especially related to RaaS of the orgaization requirement, which is providing the efficient and effective of services or also called as quality of services (QoS) for community of practice (CoP) in a particular environment.

Brief Biography of the Speaker: Rusli Abdullah is a Associate Professor in Information System Department, Faculty of Computer Science and Information Technology, of Universiti Putra Malaysia. He holds a B.Sc in Computer Science from Universiti Putra Malaysia (1988), M.Sc in Computer Science from Universiti Putra Malaysia (1996), and PhD in Knowledge Management at Faculty of Computer Science and Information System at Universiti Teknologi Malaysia (2005). He has more than 12 years of teaching experience and about 8 years of system development experience as a system analyst at higher learning institutions. He currently teaches System Analysis and Design, and Software Quality at both undergraduate and graduate levels. His research interests include knowledge management and software engineering, computer supported collaborative of work, and workflow management. He has also published and written books, articles, and technical papers in numerous journals and conference proceedings with regards to his research interests. Some of his published books in Malay version are Introduction to Workgroup Computing, Introduction to Analysis and Design Systems, and Information Technology and Its Applications.