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Transactions on Computational Science XVIII

Special Issue on Cyberworlds



Springer

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LNCS Transactions on Computational Science

Computational science, an emerging and increasingly vital field, is now widely recognized as an integral part of scientific and technical investigations, affecting researchers and practitioners in areas ranging from aerospace and automotive research to biochemistry, electronics, geosciences, mathematics, and physics. Computer systems research and the exploitation of applied research naturally complement each other. The increased complexity of many challenges in computational science demands the use of supercomputing, parallel processing, sophisticated algorithms, and advanced system software and architecture. It is therefore invaluable to have input by systems research experts in applied computational science research.

Transactions on Computational Science focuses on original high-quality research in the realm of computational science in parallel and distributed environments, also encompassing the underlying theoretical foundations and the applications of large-scale computation. The journal offers practitioners and researchers the opportunity to share computational techniques and solutions in this area, to identify new issues, and to shape future directions for research, and it enables industrial users to apply leading-edge, large-scale, high-performance computational methods.

In addition to addressing various research and application issues, the journal aims to present material that is validated – crucial to the application and advancement of the research conducted in academic and industrial settings. In this spirit, the journal focuses on publications that present results and computational techniques that are verifiable.

Scope

The scope of the journal includes, but is not limited to, the following computational methods and applications:

- Aeronautics and Aerospace
- Astrophysics
- Bioinformatics
- Climate and Weather Modeling
- Communication and Data Networks
- Compilers and Operating Systems
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- Computational Number Theory
- Computational Physics
- Data Storage
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- Grid Computing
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- High-Energy Physics
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- Modeling and Simulations
- Numerical and Scientific Computing
- Parallel and Distributed Computing
- Reconfigurable Hardware
- Supercomputing
- System-on-Chip Design and Engineering
- Virtual Reality
- Visualization

Editorial

The Transactions on Computational Science journal is part of the Springer series *Lecture Notes in Computer Science*, and is devoted to the gamut of computational science issues, from theoretical aspects to application-dependent studies and the validation of emerging technologies.

The journal focuses on original high-quality research in the realm of computational science in parallel and distributed environments, encompassing the facilitating theoretical foundations and the applications of large-scale computations and massive data processing. Practitioners and researchers share computational techniques and solutions in the area, identify new issues, and shape future directions for research, as well as enable industrial users to apply the techniques presented.

The current volume is devoted to the topic of security in virtual worlds and is edited by Arjan Kuijper. It is comprised of 14 excellent papers selected from 75 submissions to The International Conference on Cyberworlds 2012, held in Darmstadt, Germany, September 25–27, 2012.

We would like to extend our sincere appreciation to the special issue guest editor Arjan Kuijper for his diligent work in preparing this special issue. We would also like to thank all of the authors for submitting their papers to the special issue, and the associate editors and referees for their valuable work. We would like to express our gratitude to the LNCS editorial staff of Springer, in particular Alfred Hofmann, Ursula Barth and Anna Kramer, who supported us at every stage of the project.

It is our hope that the fine collection of papers presented in this special issue will be a valuable resource for Transactions on Computational Science readers and will stimulate further research into the vibrant area of computer security.

March 2013

Marina L. Gavrilova
C.J. Kenneth Tan

Guest Editor's Preface

Special Issue on Cyberworlds

Created intentionally or spontaneously, cyberworlds are information spaces and communities that immensely augment the way we interact, participate in business, and receive information throughout the world. Cyberworlds seriously impact our lives and the evolution of the world economy by taking such forms as social networking services, 3D shared virtual communities, and massively multiplayer online role-playing games.

The International Conference on Cyberworlds 2012 addressed a wide range of research and development topics. Out of the 75 registered papers a final selection of 30 full, 13 invited, and 6 short papers comprised the CW 2012 program. Full papers were sent to 4 reviewers; short and invited papers were evaluated by 3 reviewers. The 14 articles appearing in this special issue are revised and extended versions of a selection of papers presented at CW 2012. The papers were selected based on reviewers' comments, on the quality of the oral presentations, and the conference delegates' feedback.

Nowadays game consoles are very powerful and specialized for interactive graphics applications; therefore they are very suitable to be applied for rendering purposes. The first paper, "*Distributed Rendering for Interactive Multiscreen Visualization Environments*" proposes a framework developed on Microsoft's XNA Game Studio. It supports interactive distributed rendering on multiple Xbox 360 and PC setups.

In "*Training Interpreters Using Virtual Worlds*", the design and development of the IVY Virtual Environment and the asset management system is presented. In IVY, users can make a selection from over 30 interpreter training scenarios situated in the 3D virtual world. Users then interpret the oral interaction of two avatar actors.

"*Mathematical Foundations for Designing a 3-Dimensional Sketch Book*" helps a non-professional user draw a mountain from a rough image to an image using filtration. The interactive procedure is repeated until a satisfactory result is obtained by giving the most important points and curves at the first stage and adding less important points and curves later on.

In "*Image-Based Virtual Palpation*", 2D images rather than 3D polygonal models are used. A number of patients of different age and gender can be generated just by replacing the images. Internal organs are represented by implicit functions, so one doesn't need to construct every model independently. Instead, different scaling parameters of the respective defining functions can be adjusted to represent various conditions, i.e., normal or inflammatory, for a particular organ.

vAcademia is a 3D virtual world designed for collaborative learning. It enables a new approach to educational activities in virtual worlds, which is based on a new vision of content and learning processes.

"Asynchronous Immersive Classes in a 3D Virtual World: Extended Description of vAcademia" presents the functionality, scenarios of use, and the initial evaluation results of the vAcademia virtual world.

Emotions are important in human-computer interaction. Emotions can be classified based on a 3-dimensional Valence-Arousal-Dominance model, which permits the definition of any number of emotions even without discrete emotion labels. The paper *"Real-Time Fractal-Based Valence Level Recognition from EEG"* presents a real-time fractal dimension (FD) based valence level recognition algorithm from Electroencephalographic (EEG) signals. The proposed algorithm can be implemented in different real-time applications such as emotional avatar and e-learning systems.

The continual increase in losses from natural and man-made disasters in recent decades dictates a necessity both to develop new technologies for disaster prevention and response and also to reconsider the cornerstone concepts for disaster analysis, management, and engineering. This is discussed in *"Towards Multi-hazard Resilience as a New Engineering Paradigm for Safety and Security Provision of Built Environments"*.

Face recognition is not limited only to recognizing human faces but can also be applied to non-biological entities such as avatars from virtual worlds. In *"Recognizing Avatar Faces Using Wavelet-Based Adaptive Local Binary Patterns with Directional Statistical Features"* a novel face recognition technique outperforms current methods on two virtual world avatar face image datasets.

"Real-Time Reactive Biped Characters – Staying Upright and Balanced" presents a real-time technique for generating reactive balancing biped character motions for use in time critical systems, such as games. It demonstrates the straightforwardness and robustness of the technique by means of simulation examples.

Modern interactive environments like virtual reality simulators or augmented reality systems often require reliable information about a user's future intention in order to increase their immersion and usefulness. For many of these systems, where human locomotion is an essential way of interaction, knowing a user's future walking direction provides relevant information. *"Using Head Tracking Data for Robust Short Term Path Prediction of Human Locomotion"* explains how head tracking data can be used to retrieve a person's intended direction of walking.

"A Computational Model of Emotional Attention for Autonomous Agents" proposes a biologically inspired computational model of emotional attention. This model is designed to provide AAs with adequate mechanisms to attend and react to emotionally salient elements in the environment.

In *"Haptic Rendering of Volume Data with Collision Detection Guarantee Using Path Finding"* a novel haptic rendering method for exploration of volumetric data is presented. It addresses a recurring flaw in almost all related approaches,

where the manipulated object, when moved too quickly, can go through or inside an obstacle.

Recent studies have shown that people with mild cognitive impairment (MCI) may convert to Alzheimer's disease (AD) over time although not all MCI cases progress to dementia. "*Towards Early Diagnosis of Dementia Using a Virtual Environment*" presents a virtual environment that can be utilized as a quick, easy, and friendly tool for early diagnosis of dementia. This tool was developed with the aim of investigating cognitive functioning in a group of healthy elderly and those with MCI. It focuses on the task of following a route, since topographical disorientation is common in AD.

When realizing gestural interaction in a typical living environment there often is an offset between user-perceived and machine-perceived direction of pointing, which can hinder reliable selection of elements in the surroundings. The last paper, "*Providing Visual Support for Selecting Reactive Elements in Intelligent Environments*", presents a support system that provides visual feedback to a freely gesturing user, thus enabling reliable selection of and interaction with reactive elements in intelligent environments

Thanks and appreciation go to the authors, the reviewers, and the staff working on the Transactions of Computational Science.

March 2013

Arjan Kuijper

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