Editorial

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Biographical notes: Francesco Quaglia received the Laurea Degree (MS level) in Electronic Engineering in 1995 and the PhD Degree in Computer Engineering in 1999 from the University of Rome 'La Sapienza'. From summer 1999 to summer 2000, he held an appointment as a Researcher at the Italian National Research Council (CNR). Since January 2005, he works as an Associate Professor at the School of Engineering of the University of Rome 'La Sapienza', where he has previously worked as an Assistant Professor since September 2000 to December 2004. His research interests span from theoretical to practical aspects concerning distributed systems and applications, distributed protocols, middleware platforms, parallel discrete event simulation, federated simulation systems, parallel computing applications, fault-tolerant programming and transactional systems. He has served as Program Co-Chair of ACM PADS 2002, as Program Co-Chair of IEEE NCA 2007, and as General Chair of ACM PADS 2008. Since 2004, he has been is an Editorial Board Member of the *International Journal of Simulation and Process Modelling (IJSPM)*.

Welcome to this special issue of the *International Journal of Simulation and Process Modelling* devoted to Parallel and Distributed Simulation (PDS). The objective of this issue is to provide the reader with recent results on hot topics in the PDS research area. All the papers appearing in this issue are invited papers from well known experts in the area. Also, they are revised and extended versions of papers recently presented in reference conferences for the PDS community, such as PADS (the Workshop on Principles of Advanced and Distributed Simulation) and DS-RT (the Symposium on Distributed Simulation and Real-Time Applications).

The set of topics addressed by these papers is very wide, in particular the reader can find results ranging from the design of traditional parallel/distributed simulation platforms, with a focus on system level and/or application level aspects, to more innovative paradigms for what concerns the usage of computing resources and the possibility to reuse and/or integrate simulation models and packages. Also, different perspectives are provided, since some of the papers show a theoretical shape, while other papers are more oriented to pragmatic aspects.

The paper 'Seven-O'clock: a new distributed GVT algorithm using network atomic operations' by David W. Bauer Jr. and Christopher D. Carothers, and the paper 'Local fossil identification in time warp simulations' by Malolan Chetlur and Philip A. Wilsey, both tackle the issue of memory recovery in optimistic simulation systems. The former paper provides an approach to the evaluation of the safe logical time for the identification the committed part of the simulation and for discarding information no longer required for rollback purposes. This solution works in a distributed environment where different processors share an accurate common view of wall-clock time. The second paper presents an approach for discarding committed information which does not require safe time identification on a global scale. Instead, causality tracking mechanisms are used as the basis for allowing each process involved in the simulation to locally identify the information that will no longer be required for synchronisation purposes.

The paper 'Reversible discrete event formulation and optimistic parallel execution of vehicular traffic models' by Srikanth B. Yoginath and Kalyan S. Perumalla, also deals with optimistic simulation. In particular, it explores reverse computation techniques for supporting optimised rollback based synchronisation in the context of vehicular traffic simulation.

Load-balancing aspects, with a focus on both computation and communication costs, are addressed in the paper 'Distributed simulation of large-scale and detailed models' by Gabriele D'Angelo and Michele Bracuto. It provides an implementation of middleware level load balancing heuristics tailored to conservative (time-stepped) synchronisation. The evaluation of the proposed approach has been carried out via simulation of the 802.11 DCF protocol.

The paper 'A rule-based semantic matching of base object models' by Farshad Moradi, Rassul Ayani, Shahab Mokarizadeh and Gary Tan, copes with

simulation models' composability in the context of the HLA (high-level architecture) interoperability standard. In particular, advanced aspects related to semantic issues in the composition process are addressed. Also, a layered architecture supporting composition steps is presented.

The paper 'Real-time network simulation support for scalable routing experiments' by Yue Li, Jason Liu and Raju Rangaswami presents a simulation infrastructure where a pre-existing parallel network simulator with real-time capabilities is integrated with the open-source XORP router. Ad-hoc integration techniques are presented in order to achieve, beyond realism, scalability and flexibility.

Finally, the paper 'Parallel discrete event simulation on desktop grid computing infrastructures' by Alfred Park and Richard M. Fujimoto investigates the usage of the master/worker paradigm, typically employed for functional decomposition of parallel/distributed applications, in simulation scenarios. The objective is the exploitation of public and desktop grid computing infrastructures. An implementation supporting this paradigm and some performance results are presented for the case of conservative synchronisation.

I thank all the authors who have accepted my invitation for this special issue. Finally, I would like to thank Professor Nuno Melao, our Editor-in-Chief, for giving me the opportunity to edit this special issue, and for asking me to contribute to the issue with a position paper reflecting my own view on specific aspects related to PDS. This paper, entitled 'On the construction of committed consistent global States in optimistic simulation', deals with techniques for building consistent and committed global snapshots by re-using/updating checkpoints of the different processes taken in an uncorrelated manner during the forward execution phase in optimistic simulation systems. These techniques have also been integrated within an operating optimistic simulation environment. A straightforward application is global predicates' evaluation.