Guest Editors’ Introduction to the Special Section on the First International Conference on the Quantitative Evaluation of SysTems (QEST)

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Welcome to the special section of the IEEE Transactions on Software Engineering (TSE) devoted to QEST 2004, the first International Conference on the Quantitative Evaluation of SysTems that was held at the University of Twente, The Netherlands, 27-30 September 2004. QEST was created as a major forum for evaluation and verification of computer and communication systems, using measurements and stochastic models, and possibly incorporating nondeterministic behavior. The conference includes modeling formalisms and methodologies, theory, tools and case studies related to measurements, analytical and numerical evaluation, simulation and verification, and the theory of probabilistic systems. Properties of interest include, but are not limited to, performance, dependability, safety, security, and survivability. QEST is the successor to four conferences: Modeling Techniques and Tools for Computer Performance Evaluation (held 12 times since 1984), Petri Nets and Performance Models (held 10 times since 1985), Process Algebras and Performance Modeling (held 10 times since 1993), and Probabilistic Methods In Verification (held five times since 1998). QEST 2005 was held in Torino Italy, and QEST 2006 will take place in Riverside, California.

QEST 2004 received 80 submissions from which 28 were included in the proceedings published by IEEE CS Press. This special section contains extended versions of three of these papers, which have been subject to the normal review procedure for TSE. We briefly describe these contributions in the following.

"Backward Bisimulation in Markov Chain Model Checking" by Jemery Sproston and Susanna Donatelli considers a rather new approach to checking properties of Markov chains, namely, model checking. It is a known fact that ordinary lumpability in Markov chains coincides with logical equivalence for CSL, a branching-time temporal logic for continuous-time Markov chains. The authors extend this result by considering exact lumpability (which corresponds to a “backward” bisimulation). A precise characterization is given of the type of CSL formulae that are preserved by backward bisimulation, a generalization toward Markov reward models (and the logic CSRL) is given as well as a description on how these results can be used in the model-checking algorithm for CS(R)L.

"Analysis of Restart Mechanisms in Software Systems" by Aad P.A. van Moorsel and Katinka Wolter is concerned with the analysis of the completion time distribution of jobs under the policy of restarts. The basic idea of restarts is that, if the job has not finished by a certain time, then by restarting the job one can improve the completion time of the job. This is best explained through the motivating example of downloading a Web page: When the page takes a long time to download, one clicks the reload button (restarts the job) to hopefully decrease the overall time to download the Web page. The paper presents a comprehensive study of a simple (although realistic) model of this problem. The analysis includes a number of interesting and important results, including, among others, a scheme to calculate the moments of the completion time distribution under both infinite and finite restarts, an algorithm to find the optimum expected completion time for finite restarts, and necessary and sufficient conditions on the distribution of a job for it to benefit from restarts.

"Saturation for a General Class of Models" by Andrew S. Miner presents extended versions of the saturation algorithm for matrix diagrams. This algorithm is known for its good efficiency in checking reachability (and more complicated) properties on large state spaces. The basic algorithm has some restrictions, mainly that the effect of an action on a component of the model depends only on the substate of this component. With the newly developed algorithms, the local state spaces and the next-state functions of discrete-state models without all these restrictions can be efficiently constructed. Experimental results are provided, comparing the computational effort in space and time.

We thank all of the authors who submitted their extended versions and all of the reviewers who did a great job by writing very detailed and helpful reviews. We also thank the general chair, Boudewijn Haverkort, for his efforts to make QEST 2004 successful.

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