

## Editorial

### Background

The International Conference on Quality Software (QSIC)<sup>1</sup> series of conferences aims at providing a forum to bring together researchers and practitioners working on improving the quality of software, to present new results and exchange ideas in this challenging area. Progress is badly needed here: whoever depends on the use of software, directly or indirectly (and that means most of us), is still plagued by unresolved errors in many of the software systems that are in use every day.

With previous conferences in Hong Kong (2000 and 2001) and in Dallas (2003), the 2004 conference was the first to go to Europe: it was held in Braunschweig, Germany. In the tradition of this conferences series, research papers and experience reports on various aspects of quality software were presented. In variation of its predecessors, however, there was a special focus on quality information systems, but contributions were not limited to this area. Software testing and software quality assurance were still the major issues, but there were also contributions addressing distributed and web-based information systems, information and knowledge management, and conceptual modeling, among others. The conference proceedings are available from IEEE Computer Society Press.

After the conference, selected authors were invited to submit revised and expanded versions of their contributions for a special issue of the *Journal of Systems and Software*. After a further reviewing process, five of the submissions were accepted for publication in this special issue.

### The papers

Testing was and is at the core of software validation methods, so the first three papers deal with variations of

this theme. The other two papers address information system issues.

Test case selection criteria are one of the most important topics in software testing research. This is the subject of the first paper, *A Comparison of MC/DC, MUMCUT and Several Other Coverage Criteria for Logical Decisions* by Y.T. Yu and M.F. Lau. Logical decisions are widely used in software, both in specifications and in code. Although many coverage criteria are well known for testing logical decisions, the fault-detecting ability of test sets satisfying these criteria has been largely unclear. To contribute to this body of knowledge, this paper performs both formal and empirical analysis to compare MC/DC, MUMCUT and several other related criteria.

The second paper, *On the Statistical Properties of Testing Effectiveness Measures* by T.Y. Chen, F.-C. Kuo and R. Merkel, provides new insights, gained from both mathematical analysis and simulations, into three testing effectiveness measures: the *F*-measure, *P*-measure, and *E*-measure. The analysis is conducted specifically in the context of random testing and adaptive random testing, but many of the results are applicable more broadly. Additionally, a more detailed examination of the failure detection capabilities of adaptive random testing provides a much clearer picture of its superior effectiveness when compared to random testing.

The third paper presents a methodology which can be applied for testing multi-media systems using a classification-based, statistical approach: *Automatic Goal-Oriented Classification of Failure Behaviors to Testing XML-Based Multimedia Systems: an Experimental Case Study* by W.K. Chan, M.Y. Cheng, S.C. Cheung and T.H. Tse. The paper studies the difficulties in testing multimedia software applications, which include (i) the forbidding sizes of the input domains, (ii) non-reproducible outcomes of a test case in some situations, and (iii) the test oracle problem. A testing methodology is proposed in this paper to alleviate the problems. Although only SMIL-based multimedia software applications are examined in this paper, the methodology

<sup>1</sup> The acronym reminds us of the high quality and strength of Cu-SiC, a ceramic reinforced metal.

can be applied to other kinds of applications with input data profiles.

The last two papers deal with aspects of information systems and their core systems, databases. The article *ASM-Based Design of Data Warehouses and On-Line Analytical Processing Systems* by Jane Zhao and Hui Ma is the first of these. It presents a method for the design of data warehouses and online analytical processing (OLAP) systems based on Abstract State Machines (ASMs). Based on the general idea of data warehouses separating input from operational databases from output to dialogue-based on-line OLAP, such systems can be modeled by three interleaved high-level ASMs. Further development of the data warehouse and the OLAP interfaces can be based on step-wise refinement of such a “ground model” ASM. In the article, formal refinement rules for this purpose are addressed in particular.

Last but not least, the article *Semantic Errors in SQL Queries: A Quite Complete List* by Stefan Brass and Christian Goldberg characterizes a number of semantic errors in SQL queries, i.e., classes of queries which are syntactically correct but which are (almost) certain to be not “intended”. Current relational database management systems tend to execute such queries without warning, wasting many resources on both the system and the user sides. The authors show how intelligent warnings can be incorporated into database systems, and how helpful they would be for users. The paper is structured by reasons why SQL queries can be considered suspicious, like unnecessary complications, inefficient formulations, violations of standard patterns, many duplicates, and others.

## Looking ahead

After the successes of four quality software conferences, the Fifth International Conference on Quality Software (QSIC 2005) is held in Melbourne, Australia, on September 19–21, 2005. Kai-Yuan Cai, Beijing University of Aeronautics and Astronautics, China and Atsushi Ohnishi, Ritsumeikan University, Japan serve as program co-chairs. Please visit <http://www.ict.swin.edu.au/conferences/qsic2005>.

**Hans-Dieter Ehrich** studied Mathematics and Physics at Kiel University, Germany, where he received a Diploma in Mathematics in 1967. In 1970, he received his Ph.D. in Mathematics from Hanover University. In 1974, he became Associate Professor of Theoretical Computer Science at Dortmund University from where he moved to a full professorship at Braunschweig Technical University in 1982. There he holds a chair of databases and information systems. Emphasis in his scientific work is on conceptual modeling, specification, checking and

implementation of information systems, including foundations, language concepts, methods, tools and applications. The overall emphasis is on complete and analysable modeling on a high level of abstraction where structural as well as behavioural aspects of objects, modules and systems are being addressed.

**Klaus-Dieter Schewe** studied Mathematics and Computer Science at Bonn University, Germany. In 1985 he received his Ph.D. in Mathematics from Bonn University. During 1985 and 1990 he worked with large industrial companies in the fields of artificial intelligence, software engineering, and office information systems. Returning to Hamburg University in 1990 he worked on formal specifications and semantics and database theory. In 1995 he received the habilitation (=D.Sc.) in Theoretical Computer Science from the Brandenburgian Technical University at Cottbus, Germany. From 1994 to 1999 he worked at the Computer Science Department of the Technical University Clausthal. Since 2000, he is the Chair of Information Systems at Massey University in New Zealand. Since 2003, he is also the Director of the Information Science Research Centre at Massey University. Since his habilitation, his major fields of interest are formal specifications and semantics, logic in computer science, database theory, distributed object bases, and design of integrated information systems.

**T.H. Tse** is the Director of the Software Engineering Programme at The University of Hong Kong. He is also an Advisory Professor at East China Normal University, China. He received his Ph.D. in Information Systems from University of London and was a Visiting Fellow at University of Oxford. He is an Editor of *Journal of Systems and Software*. He has been a Steering Committee Member of COMPSAC since 2002 and the Steering Committee Chair of QSIC since 2003. He is a Fellow of the British Computer Society, a Fellow of the Institute for the Management of Information Systems, a Fellow of the Institute of Mathematics and its Applications, and a Fellow of the Hong Kong Institution of Engineers. He was selected for a “Ministry of Education Nominated State Science and Technology Award” in China. He was decorated with an MBE by The Queen.

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