

## GUEST EDITORS' INTRODUCTION

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### **Background**

Software systems play an indispensable role in our daily lives. On the other hand, they often fail to deliver according to user requirements. It is well known that unresolved problems still exist in many of the popular software applications in the market. The enhancement of software quality is a major challenge for software engineers.

This special issue on quality software aims at addressing this challenge. It is associated with the 6th International Conference on Quality Software (QSIC 2006). The QSIC series of conferences provides a forum to bring together researchers and practitioners working on improving the quality of software, to present new results, and to exchange ideas in this important area. The preceding conferences were held in Hong Kong; Dallas, USA; Braunschweig, Germany; and Melbourne, Australia. They received overwhelming responses from academia as well as industry. The proceedings were published by IEEE Computer Society Press.

QSIC 2006 was held in Beijing, China. Hong Mei served as the Program Chair and T. H. Tse was the Steering Committee Chair. 181 submissions were received, covering a large variety of topics including software testing, software quality, methods and tools, evaluation of software products and components, information and knowledge management, formal methods, component software and reuse, emerging technology, and applications. Each submission was assigned to at least three PC members. In the end, 50 conference papers were published in the proceedings, representing an acceptance rate of 28%.

After the conference, selected authors were invited to submit expanded versions of their papers to the special issue on quality software. After further rounds of reviews, four submissions were accepted for this special issue.

## The Papers

Software metric models can be used to predict the properties of target software. On the other hand, such models need to be simplified because of the presence of incomplete data samples and redundant predictor metrics. The first paper, “A Statistical Methodology to Simplify Software Metric Models Constructed Using Incomplete Data Samples: Its Procedure and Two Case Studies” by Victor K. Y. Chan, W. Eric Wong, and T. F. Xie, describes an integrated methodology to tackle such problems in the construction of software metric models. It makes use of the  $k$ -nearest neighbors imputation method, statistical hypothesis testing, and a goodness-of-fit criterion. The proposal was verified on software effort metric models and software quality metric models.

The usefulness of software architecture modeling cannot be completely fulfilled unless the designs are realized automatically in implementations. The second paper, “A Translator of Software Architecture Design from SAM to Java” by Yujian Fu, Zhijiang Dong and Xudong He, addresses this issue. It presents method based on an architecture model that integrates Petri nets and temporal logic. Given an architecture description, an implementation can automatically be generated, capturing the functionality and including monitoring code that supports run-time verification.

The testing of imaging software has to be done manually and is therefore tedious and error-prone. How to fully automate this process is the subject of the third paper “Towards Automatic Testing of Imaging Software by Means of Random and Metamorphic Testing” by Ralph Guderlei and Johannes Mayer. The paper proposes several random models for test case generation and automatically verifies the test results with metamorphic relations. The proposals in the paper are evaluated by mutation analysis. Based on the results, general guidelines on test case selection in image processing are presented.

The fourth paper, “Crème: An Automatic Invariant Prover of Behavioral Specifications” by Masahiro Nakano, Kazuhiro Ogata, Masaki Nakamura and Kokichi Futatsugi, describes a method to automatically verify the invariants in behavioral specifications. The method is based on fixed-point computation and applied to algebraic specifications of observational transition systems. A tool, known as Crème, has been developed according to the method. Two case studies have been conducted using Crème as a prover.

## Looking Ahead

After the successes of six quality software conferences, the 7th International Conference on Quality Software (QSIC 2007) was held in Portland, Oregon, USA on October 11–12, 2007. Aditya Mathur of Purdue University and W. Eric Wong of the University of Texas at Dallas served as the program co-chairs. Please visit <http://paris.utdallas.edu/qsic07/> for more details.