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Editorial: Addressing industrial challenges—UKTest 2005 and beyond

The Third U.K. Workshop on Software Testing Research (UKTest 2005) was held at the University of Sheffield on the 5th and 6th September 2005. The event followed on from two previous testing workshops held at the University of York in 1998 and 2003. The General Chair was Rob Hierons of Brunel University. Phil McMinn, of the University of Sheffield, was Programme Chair and Local Organiser. Fourteen papers were accepted for presentation, following a reviewing process by members of the eighteen-strong programme committee, with each paper receiving at least three reviews. The workshop was comprised of four distinct sessions: empirical software testing; formal models and approaches to testing; search-based software testing; and, finally, industrial experience and work on tools.

As has been the tradition at U.K. testing workshops, and events of the accompanying FORTEST network on formal methods and testing that was funded by the U.K. Engineering and Physical Sciences Research Council (EPSRC), participants were from both industry and academia. Three papers were presented by representatives from industry, with both keynote speakers also coming from industry—Paul Gibson, Development Operations Manager at IBM Hursley, and Alan Richardson of BJSS. Paul Gibson's keynote talk got the event underway with a series of 'challenges' from IBM to the academic community working in software testing. These challenges, along with other questions posed to both academic and industrial communities alike, were the source of lively discussion between participants in special sessions organized at the event.

The three papers in this special issue are extended versions of some of the best papers originally submitted to the workshop, and have been through a further reviewing process. The first paper, by Anthony Simons of the University of Sheffield, describes a new theory of object compatibility based on state machines (specifically, object X-machines) and state refinement. An important result of the theory has negative implications for regression testing: the theory shows that test sets developed from a parent object cover *less* of the state space of the parent object when testing one of its children. Thus, modified objects could pass the tests designed to confirm behaviour of previously existing functionality, but with newly introduced and undetected faults. The level of confidence obtained by reusing unit tests to establish the soundness of modified code—a strategy adopted by the eXtreme Programming (XP) community—might therefore be less than expected. Simons proposes that test cases are regenerated for modified objects from state-based specifications, in order to maintain confidence levels after re-testing.

The second paper presents work undertaken in industry by Elena Pérez-Miñana and Jean-Jacques Gras of Motorola. The paper reports the use of Bayesian networks for fault prediction in stages of the software development process. Two alternative methods are presented for fine-tuning a set of Bayesian

networks in order to predict fault density statistics accurately for a particular development team, using data from past and present projects. In the first method, these data are used to adjust the ranges of the nodes in the networks, along with their weights and interdependencies. This is compared with an alternative method, which draws on linear regression and principal component analysis techniques in order to construct the intermediate and output nodes of the networks in question. The results of a case study are then presented, where the networks are trained using data from the requirements, design and coding phases of the development of a software system.

In the third paper, Mohammad Alshraideh and Leonardo Bottaci of the University of Hull present work in the field of search-based test data generation. New and existing string metrics are proposed as the basis of fitness functions to search for structural test data evaluating predicates that deal with variables of a string type. Prior work in this field has largely considered predicates containing variables of a numeric nature. Three different fitness operators are proposed for predicates evaluating string equality, with further operators designed for predicates evaluating string ordering and regular expressions. Alshraideh and Bottaci also discuss and evaluate methods for reducing the domains of the string inputs, and propose a mutation operator for biasing the search towards string literals that appear in the program.

Thanks to the hard work of many, the U.K. testing workshops and FORTEST have helped nurture and develop links between academia and industry in software testing. It is now time to cement this special relationship in the form of a specialized event. *TAIC PART (Testing: Academic & Industrial Conference —Practice And Research Techniques)* is planned to take place in Windsor in August 2006 and again in 2007. TAIC PART (http://www.taicpart.org) has the explicit aim of strengthening links between industry and academia, and fostering their collaboration in the area of software testing. It builds on the strengths of previous workshops on testing held in the U.K., increasing levels of involvement by drawing on academics and industrial practitioners from the wider international testing community. The proceedings are scheduled for formal publication by the IEEE Computer Society. The 2006 event has received significant monetary support from the EPSRC, along with sponsorship from six industrial partners.

Although the event is titled as a conference, it will remain very much a workshop in character, blending the best features of conference, workshop and a retreat. It will be a lively forum for the ongoing discussion of industrial challenges and the development of new ideas and techniques to solve them. The event promises to be very exciting. We hope to see you there: if not this year, then maybe in 2007, as plans are already well in hand for TAIC PART 2007.

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