Data Mutation Testing Applied to a Modelling Tool

(Abstract)

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Computer software is increasingly applied to processing data that are not only in large volumes but also in high complexity, which consist of elements connected in complicated ways. A typical example is software modelling tools whose valid inputs are diagrams that contain interconnected elements complying with the syntax rules and satisfying well-formedness and consistent constraints defined by a modelling language. Other well-known software systems with structurally complex input include compilers of textual programming languages, XML document processors, software for computer aided designs, etc. To test such a software system adequately, test cases must be generated with a huge number of combinations of the values of the elements and valid ways they can be interrelated. Manually preparing such test cases is tremendously labour-intensive, difficult and error-prone. The data mutation was thus proposed to address the test case generation problem for such systems [SZ06, SZ07]. It was inspired by mutation testing methods [DLS78, Ha77]. However, while traditional mutation testing is a method for measuring test adequacy, data mutation is a method of test case generation. In traditional mutation testing, mutation operators are used to inject faults to the program under test in order to determine if faulty programs can be detected by the test cases. In contrast, data mutation operators are applied on input data to generate a large number of test data from a few seed test cases.

The talk will describe the general principles of data mutation testing method. It is then applied to testing an automated modelling tool. Experiment data clearly demonstrate that test data generated by the method can be adequate and cost effective. It is capable to detect over 80:‖ faults.

References

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Biography

Dr. Hong Zhu is a professor of computer science at Oxford Brookes University, UK, and chairs the Applied Formal Methods Group. He obtained his BSc, MSc and PhD degrees in Computer Science from Nanjing University, China, in 1982, 1984 and 1987, respectively. He was with Nanjing University from Sept. 1987 to 1998 and a research fellow at Brunel University and the Open University, UK, from Oct. 1990 to Dec. 1994 while on leave from Nanjing University. He joined Oxford Brookes University in Nov. 1998.

Prof. Zhu's research interests are in the area of software engineering including software testing and software development methodologies. He has published more than 120 research papers and two books. He has won a number of prizes, which include the Premier's Award of Distinguished Young Scientists in China in 1997.