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Structured Object-Oriented Formal Language and Method

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Preface

In spite of extensive research on formal methods and many efforts on transferring the technology to industry over the last three decades, how to enable practitioners to easily and effectively use formal techniques still remains challenging. The Structured Object-Oriented Formal Language (SOFL) has been developed to address this challenge by providing a comprehensive specification language, a practical modeling method, various verification and validation techniques, and tool support through effective integration of formal methods with conventional software engineering techniques. SOFL integrates data flow diagram, Petri nets, and VDM-SL to offer a visualized and formal notation for constructing specification; a three-step approach to requirements acquisition and system design; specification-based inspection and testing methods for detecting errors in both specifications and programs; and a set of tools to support modeling and verification. The Modeling, Simulation and Verification Language (MSVL) is a parallel programming language. Its supporting toolkit MSV has been developed to enable us to model, simulate, and verify a system in a formal manner.

Following the success of the previous SOFL+MSVL workshops, the 6th international workshop on SOFL+MSVL 2016 was jointly organized in Tokyo by Shaoying Liu's research group at Hosei University, Japan, and Zhenhua Duan's research group at Xidian University, China, with the aim of bringing together industrial, academic, and government experts and practitioners of SOFL or MSVL to communicate and to exchange ideas. Also, one invited keynote talk was on verification of Web applications. The keynote speaker was Prof. Huaikou Miao, Shanghai University, China. The workshop attracted 26 submissions on specification-based testing, specification inspection, model checking, formal verification, formal semantics, and formal analysis. Each submission was rigorously reviewed by two or more Program Committee members on the basis of its technical quality, relevance, significance, and clarity, and 13 papers were accepted for publication in the workshop proceedings. The acceptance rate is 50%.

We would like to thank ICFEM 2016 for supporting the organization of the workshop, all of the Program Committee members for their great efforts and cooperation in reviewing and selecting the papers, and our postgraduate students for their various help. We would also like to thank all of the participants for attending presentation sessions and actively joining discussions at the workshop. Finally, our gratitude goes to Alfred Hofmann and Christine Reiss of Springer for their continuous support in the publication of the workshop proceedings.

November 2016

Cong Tian
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A CEGAR Based Approach to Verifying Web Application (Abstract of Invited Talk)

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Abstract. How to model and verify navigational behaviors of Web application is the key issue to ensure the reliability of Web engineering. The feature of user behaviors includes inputting URLs to Web browser's address bar, clicking the hyperlink in Web page and clicking the *back* or *forward* button of Web browser. The dynamic behaviors should be verified. In recent years, model checking has been used for Web application modeling and verification. But Web application's behaviors and interactions are prone to the states space explosion problem, in which the computation, validation, and complexity will also rapidly increase.

After analyzing the interactive interactions between the user and Web browser, we propose a CEGAR method + On-the-fly approach. We apply On-the-fly strategy and Counterexample-Guided Abstraction Refinement (CEGAR) method to Web application modeling, abstraction refinement and verification. Carrying out the verification in on-the-fly model can implement doing verification while building the model. The verification can be carried out when the part of model is generated, the counterexample can be identified before modeling all behaviors. It can be used to save the memory and time consumption during verification. For example, when the navigation model is constructed on the fly, a verification property based incremental state abstraction approach is used to generate the corresponding abstract navigation model. The CTL is used to describe the safety property. Then, an equivalence classes-based abstraction refinement is introduced to eliminate the spurious counterexample if the abstract counterexample is verified to be false. It models Web pages, and checks the validity of counterexample by using abstraction refinement. In conclusion, our approach can effectively alleviate the state explosion problem of Web application verification. In my talk, a Web application, an audit system, is taken as an example to demonstrate the approach we proposed.

Keywords: Web application · Navigation model · Abstraction refinement · Model checking · Spurious counterexample

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Contents

Model Checking