Lecture Notes in Computer Science 8373

Commenced Publication in 1973
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Specification, Algebra, and Software

Essays Dedicated to Kokichi Futatsugi

Springer

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ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-54623-5 e-ISBN 978-3-642-54624-2
DOI 10.1007/978-3-642-54624-2
Springer Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014932844

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

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Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Kokichi Futatsugi

Preface

During his entire professional life, Prof. Kokichi Futatsugi has worked in the intersection of formal methods and software engineering. He has made fundamental scientific contributions to both of these areas and is recognized as an international leader in both of them.

In formal methods he is one of the founding fathers of the field of algebraic specification and verification. In 1980 he designed and implemented the first Japanese algebraic specification language (HISP), one of the very first such languages in the world with powerful module operations. And in the mid-1980s he co-designed the OBJ algebraic specification language, at the time the most advanced language of its type in the world, which has had an enormous impact in the field of formal methods. In the 1990s he greatly expanded the reach and impact of algebraic specification and verification by supporting reasoning and executable formal specification of systems involving algebraic data types, objects, states, and concurrency through the seamless and elegant integration of equational, hidden, and rewriting logic in the so-called CafeOBJ "cube."

The CafeOBJ language and the range of verification methods and tools it supports —including its support for inductive theorem proving, verification of behavioral specifications, deductive invariant proof, and reachability analysis of concurrent systems— has played a key role in both extending and bringing algebraic specification techniques into contact with many software engineering applications. In the most recent years, the CafeOBJ approach to formal specification and verification has been further advanced under his leadership to achieve a more intimate integration between theorem proving and model checking, reach greater automation of proofs, and make further breakthroughs in deductive invariant verification.

One of the most appealing strong points of the vision brought to fruition by Kokichi Futatsugi through all these efforts is the advancement of a style of executable specification that is in fact, simultaneously, a very simple and intuitive form of declarative programming, and therefore considerably easier to understand and use by software engineers than other, more arcane formalisms. This, together with all the above-mentioned formal verification methods and tools based on such executable specifications, has brought formal methods considerably closer to software engineering practice.

His leadership in the software engineering field includes, but has not been limited to, all the above-mentioned scientific contributions: He has furthermore carried out a sustained and impressive effort to connect his formal methods work with other key areas of software engineering such as object-oriented design and model-based software development. Furthermore, with his collaborators he has developed a very impressive array of case studies showing the practical usefulness of these methods. He has also been a leading figure in the ICSE community

as its main Japanese representative over the years, has played a key role in promoting other important international research initiatives such as the ICFEM conferences that bring together researchers in formal methods and software engineering all over the word, has promoted and edited the proceedings of many other scientific events, and has served as program chair and/or on steering and program committees of numerous prestigious international scientific conferences.

In Japan his leadership and influence in formal methods and software engineering have been immense, not only among researchers, but also in bringing formal methods closer to industrial software practice.

For us it is both an honor and a pleasure to have been able to organize this event and have edited this volume. The response from the internationally leading researchers in formal methods and software engineering that we have invited has been enthusiastic. Thanks to them we have been able to assemble a remarkable body of research papers that, in different ways, bring out both the vibrancy of research in this frontier and allude to Kokichi Futatsugi's remarkable impact on it. Indeed, we believe that this festive volume and event to honor Kokichi Futatsugi afford a rather special opportunity for leading researchers at the intersection of formal methods and software engineering to reflect on and discuss some of the main research directions in this frontier in the context of the life-long ideas of one of its leading contributors.

We wish to thank all the contributors to this Festschrift volume and all the researchers who, through their careful refereeing of the papers, have allowed us to assemble a volume of very high scientific quality. We also wish to thank Alfred Hofmann and all the staff at Springer for their warm support and encouragement of this project from its very inception and for their excellent technical help. Finally, we are grateful to the Kanazawa Convention Bureau for supporting this event.

January 2014

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