Springer
Berlin
Heidelberg
New York
Hong Kong
London
Milan
Paris
Tokyo

Jin Song Dong   Jim Woodcock (Eds.)

Formal Methods and Software Engineering

5th International Conference
on Formal Engineering Methods, ICFEM 2003
Singapore, November 5-7, 2003
Proceedings

Springer

Preface

This volume contains the proceedings of the 2003 International Conference on Formal Engineering Methods (ICFEM 2003). The conference was the fifth in a series that began in 1997. ICFEM 2003 was held in Singapore during 5–7 November 2003.

ICFEM 2003 aimed to bring together researchers and practitioners from industry, academia, and government to advance the state of the art in formal engineering methods and to encourage a wider uptake of formal methods in industry.

The Program Committee received 91 submissions from more than 20 countries in various regions. After each paper was reviewed by at least three referees in each relevant field, 34 high-quality papers were accepted based on originality, technical content, presentation and relevance to formal methods and software engineering. We wish to sincerely thank all authors who submitted their work for consideration. We would also like to thank the Program Committee members and other reviewers for their great efforts in the reviewing and selecting process.

We are indebted to the three keynote speakers, Prof. Ian Hayes of the University of Queensland, Prof. Mathai Joseph of the Tata Research, Development and Design Centre, and Dr. Colin O'Halloran of QinetiQ, for accepting our invitation to address the conference.

ICFEM 2003 was well organized. It could not have been successful without the hard work and efforts of our organization, program and steering committee members. We would particularly like to thank Jifeng He and P.S. Thiagarajan for overseeing general issues of the conference, Martin Henz for handling local organization, Hugh Anderson and Aminah Ayu for handling registrations, Hai Wang for maintaining the conference Website, Shengchao Qin and Zongyan Qiu for taking care of publicity, and Yuanfang Li for his excellent assistance in preparing the proceedings with Jun Sun and in setting up and maintaining the Web review system CyberChair (developed by R. van de Stadt). Finally, our thanks to Springer-Verlag for their help with the publication.

ICFEM 2003 was sponsored and organized by the Computer Science Department, National University of Singapore. More information on this conference can be found at: `http://nt-appn.comp.nus.edu.sg/fm/icfem2003/`

November 2003   Jin Song Dong and Jim Woodcock

Organization

Conference Committee

Conference Co-chairs:	Jifeng He (IIST, United Nations U.)
	P.S. Thiagarajan (National U. of Singapore)
Program Co-chairs:	Jin Song Dong (National U. of Singapore)
	Jim Woodcock (U. of Kent)
Publicity Co-chairs:	Shengchao Qin (National U. of Singapore)
	Zongyan Qiu (Peking University)
Local Organization Chair:	Martin Henz (National U. of Singapore)
Registration:	Hugh Anderson (National U. of Singapore)
Webmasters:	Yuanfang Li (National U. of Singapore)
	Wang Hai (National U. of Singapore)
Proceedings Assistant Editor:	Yuanfang Li (National U. of Singapore)

Program Committee

Vasu Alagar	Kyo Chul Kang	Thomas Santen
Richard Banach	Kung-Kiu Lau	Klaus-Dieter Schewe
Jonathan Bowen	Shaoying Liu	Wolfram Schulte
Manfred Broy	Zhiming Liu	Graeme Smith
Michael Butler	Huimin Lin	Paul Swatman
Ana Cavalcanti	Peter Lindsay	Kenji Taguchi
Dan Craigen	Brendan Mahony	Sofiène Tahar
Jim Davies	Huaikou Miao	T.H. Tse
Jin Song Dong	Jeff Offutt	Farn Wang
Kai Engelhardt	Richard Paige	Yi Wang
John Fitzgerald	Abhik Roychoudhury	Jim Woodcock
Marc Frappier	Motoshi Saeki	Hongjun Zheng
Andy Galloway	Augusto Sampaio	Hong Zhu

Referees

Parosh Abdulla	Alessandra Cavarra	Danielle Fowler
Otmane Ait-Mohamed	Sungdeok Cha	Benoit Fraikin
Behzad Akbarpour	Haiming Chen	Frédéric Gervais
Juan Carlos Augusto	Yifeng Chen	Andy Gravell
Ho-Jung Bang	Hung Dang Van	Jim Grundy
Luis. S. Barbosa	Neville Dean	Stefan Gruner
Phil Brooke	Roger Duke	Ali Habibi
Zining Cao	Colin Fidge	Ping Hao

John Harrison	Hui Liang	Harold Simmons
Sven Hartmann	Sebastian Link	Carlo Simon
Ian Hayes	Jim McCarthy	Jing Sun
Steffen Helke	Alistair McEwan	Jun Sun
David Hemer	Sun Meng	Pasha Shabalin
Shui-Ming Ho	Yassine Mokhtari	Linda Yue Tang
Xiaoning Huang	Alexandre Mota	P.S. Thiagarajan
Ralf Huuck	Tohru Naoi	Alexei Tretiakov
Cornelia Inggs	Muan Yong Ng	Mark Utting
Czeslaw Jeske	Naoya Nitta	Frank D. Valencia
Jan Jürjens	Olga Ormandjieva	Sergiy Vilkomir
Florian Kammüller	N. Paramesh	Hai Wang
Siau-Cheng Khoo	Joey Paquet	Yan Wang
Moonjoo Kim	Anup Patnaik	Guido Wimmel
Soon-Kyeong Kim	Hong Peng	Kirsten Winter
Tai-Hyo Kim	Kasi Periyasamy	Satoshi Yamane
Markus Kirchberg	Paul Pettersson	Roland Yap Hock Chuan
Leonid Kof	Mike Poppleton	Hirokazu Yatsu
Ming Siem Kong	Stephane Lo Presti	Hongnian Yu
Maciej Koutny	Shengchao Qin	Ling Yuan
Kevin Lano	S. Ramesh	Patryk Zadarnowski
Mohamed Layouni	Ken Robinson	Wenhui Zhang
Reinhold Letz	Jan Romberg	Mao Zheng
Martin Leucker	Dirk Seifert	
Yuan Fang Li	Adnan Sherif	

Steering Committee

Chair:	Jifeng He (IIST, United Nations U.)
Members:	Keijiro Araki (Kyushu U.)
	Jin Song Dong (National U. of Singapore)
	Chris George (IIST, United Nations U.)
	Mike Hinchey (NASA)
	Shaoying Liu (Hosei U.)
	John McDermid (U. of York)
	Carroll Morgan (U. of NSW)
	Tetsuo Tamai (U. of Tokyo)
	Jim Woodcock (U. of Kent)

Table of Contents