## Lecture Notes in Computer Science

4620

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

#### **Editorial Board**

**David Hutchison** 

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Awais Rashid Mehmet Aksit (Eds.)

# Transactions on Aspect-Oriented Software Development III



#### Volume Editors

Awais Rashid Lancaster University Computing Department Lancaster LA1 4WA, UK E-mail: awais@comp.lancs.ac.uk

Mehmet Aksit University of Twente Department of Computer Science Enschede, The Netherlands E-mail: aksit@ewi.utwente.nl

Library of Congress Control Number: 2007939176

CR Subject Classification (1998): D.2, D.3, I.6, H.4, K.6

LNCS Sublibrary: SL 2 – Programming and Software Engineering

ISSN 1861-3027

ISBN-10 3-540-75161-0 Springer Berlin Heidelberg New York ISBN-13 978-3-540-75161-8 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springer.com

© Springer-Verlag Berlin Heidelberg 2007 Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India Printed on acid-free paper SPIN: 12162321 06/3180 5 4 3 2 1 0

### **Editorial**

Welcome to Volume III of Transactions on Aspect-Oriented Software Development. Since its launch in 2006 the journal has attracted a steady stream of submissions, both to its indefinitely open call for papers and to calls pertaining to special issues focusing on key topics in AOSD. At the time of writing this editorial, the total number of submissions to the journal stands at 78. This is very healthy given that it is only the second year of the journal.

The journal aims to maintain the highest standards expected of an archival work in AOSD while ensuring timely feedback and notification to the authors. Each paper is handled by an associate editor, appointed by the co-editors-in-chief, who is a specialist on the specific topic. We ensure that the associate editor does not have a conflict of interest relating to the paper assigned to him/her. If the associate editor deems the paper to be worthy of a review, s/he solicits reviews from at least three reviewers on the quality of the work. On the basis of these reviews, s/he then makes a recommendation to reject the paper; ask the authors to resubmit the paper with major revisions; accept the paper with minor revisions or accept it without any further changes. We aim to notify the authors about the outcome of the reviews within 12 weeks. In a small number of cases, either unforeseen circumstances or other commitments of reviewers may lead to some further delay but we are pleased to say that such cases remain a minority.

In cases where major or minor revisions are recommended, the authors are expected to address the reviewers' comments. Papers with major changes are passed on to the reviewers again for a second review. If, even after the second review, a paper cannot be accepted as it is or subject to minor changes, then the paper is rejected. This is to avoid an endless review cycle. The procedure is applied pragmatically in that where there is a significant difference of opinion amongst the reviewers and, provided the associate editor recommends so, the authors are given a third and final opportunity to address the reviewers' comments.

Each special issue is handled by one of the co-editors-in-chief who works closely with the guest editors to ensure that the journal's review process is followed and quality standards are maintained. Given that aspect-oriented software development is a young discipline it was decided at the editorial board meeting in March 2006 that the co-editor-in-chief not handling a special issue should be locked out of the review process completely. This allows such a co-editor-in-chief to author a paper for the special issue as normally co-editors-in-chief cannot submit a paper to the journal.

This volume constitutes the first part of the special issue on Early Aspects guest edited by João Araújo and Elisa Baniassad. The handling co-editor-in-chief was Mehmet Aksit. The special issue was very successful in attracting high quality submissions and, as a result, had to be split over two volumes of the journal. The papers in this volume focus on analysis, visualisation, conflict identification and composition of Early Aspects. The papers in volume IV focus on mapping of Early Aspects across the software lifecycle.

#### VI Editorial

We wish to thank the editorial board for their continued guidance, commitment and input on the policies of the journal, the choice of special issues as well as associate-editorship of submitted articles. We also thank the guest editors, João Araújo and Elisa Baniassad, for the excellent job they did with the special issue—the proposal they prepared is now used as a model for all special issue proposals to Transactions on AOSD. Thanks are also due to the reviewers who volunteered time amidst their busy schedules to help realize this volume. Most importantly, we wish to thank the authors who have submitted papers to the journal so far, for their contributions maintain the high quality of Transactions on AOSD.

Awais Rashid and Mehmet Aksit Co-editors-in-chief

## **Organization**

#### **Editorial Board**

Mehmet Aksit, University of Twente Shigeru Chiba, Tokyo Institute of Technology Siobhán Clarke, Trinity College Dublin Theo D'Hondt, Vrije Universtiteit Brussel Robert Filman, Google Bill Harrison, Trinity College Dublin Shmuel Katz, Technion-Israel Institute of Technology Shriram Krishnamurthi, Brown University Gregor Kiczales, University of British Columbia Karl Lieberherr, Northeastern University Mira Mezini, University of Darmstadt Oege de Moor, University of Oxford Ana Moreira, New University of Lisbon Linda Northrop, Software Engineering Institute Harold Ossher, IBM Research Awais Rashid, Lancaster University Douglas Schmidt, Vanderbilt University

#### List of Reviewers

Jaelson Castro Paul Clements Anthony Finkelstein Jeff Gray Charles Haley Stefan Hanenberg Michael Jackson Joerg Kienzle Julio Leite Carlos Lucena Oscar Pastor Pete Sawyer Dominik Stein Stan Sutton Bedir Tekinerdogan Rob Walker Jon Whittle

## Table of Contents

Conflicts and Composition	1
EA-Miner: Towards Automation in Aspect-Oriented Requirements Engineering	4
Analysis of Early Aspects in Requirements Goal Models:  A Concept-Driven Approach	40
Analysis of Crosscutting in Early Software Development Phases Based on Traceability	73
Visualizing Early Aspects with Use Case Maps	105
Handling Conflicts in Aspectual Requirements Compositions	144
Weaving Multiple Aspects in Sequence Diagrams  Jacques Klein, Franck Fleurey, and Jean-Marc Jézéquel	167
Author Index	201