30th European Conference on Object-Oriented Programming

ECOOP'16, July 18–22, 2016, Rome, Italy

Edited by
Shriram Krishnamurthi
Benjamin S. Lerner
LIPIcs – Leibniz International Proceedings in Informatics

LIPIcs is a series of high-quality conference proceedings across all fields in informatics. LIPIcs volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

Editorial Board

- Susanne Albers (TU München)
- Chris Hankin (Imperial College London)
- Deepak Kapur (University of New Mexico)
- Michael Mitzenmacher (Harvard University)
- Madhavan Mukund (Chennai Mathematical Institute)
- Catuscia Palamidessi (INRIA)
- Wolfgang Thomas (Chair, RWTH Aachen)
- Pascal Weil (CNRS and University Bordeaux)
- Reinhard Wilhelm (Saarland University)

ISSN 1868-8969

http://www.dagstuhl.de/lipics
## Contents

Preface  
*Shriram Krishnamurthi* ...................................................... 0:vii

### Regular Papers

Trace Typing: An Approach for Evaluating Retrofitted Type Systems  
*Esben Andreasen, Colin S. Gordon, Satish Chandra, Manu Sridharan, Frank Tip, and Koushik Sen* .......................................................... 1:1–1:26

QL: Object-oriented Queries on Relational Data  
*Pavel Avgustinov, Oege de Moor, Michael Peyton Jones, and Max Schäfer* ........... 2:1–2:25

Fine-grained Language Composition: A Case Study  
*Edd Barrett, Carl Friedrich Bolz, Lukas Diekmann, and Laurence Tratt* ............ 3:1–3:27

Making an Embedded DBMS JIT-friendly  
*Carl Friedrich Bolz, Darya Kurilova, and Laurence Tratt* ........................... 4:1–4:24

Reference Capabilities for Concurrency Control  
*Elias Castegren and Tobias Wrigstad* ........................................... 5:1–5:26

A Calculus for Variational Programming  
*Sheng Chen, Martin Erwig, and Eric Walkingshaw* ............................... 6:1–6:28

Interprocedural Type Specialization of JavaScript Programs Without Type Analysis  
*Maxime Chevalier-Boisvert and Marc Feeley* .................................... 7:1–7:24

C++ const and Immutability: An Empirical Study of Writes-Through-const  
*Jon Eyolfson and Patrick Lam* .................................................... 8:1–8:25

LJGS: Gradual Security Types for Object-Oriented Languages  
*Luminous Fennell and Peter Thiemann* ........................................... 9:1–9:26

Formal Language Recognition with the Java Type Checker  
*Yossi Gil and Tomer Levy* ....................................................... 10:1–10:27

IceDust: Incremental and Eventual Computation of Derived Values in Persistent Object Graphs  
*Daco C. Harkes, Danny M. Groenevenegen, and Eelco Visser* ....................... 11:1–11:26

Magic with Dynamo – Flexible Cross-Component Linking for Java with Invokedynamic  
*Kamil Jezek and Jens Dietrich* .................................................... 12:1–12:25

Object Inheritance Without Classes  
*Timothy Jones, Michael Homer, James Noble, and Kim Bruce* ....................... 13:1–13:26

One Way to Select Many  
*Jaakko Järvi and Sean Parent* .................................................... 14:1–14:26

Program Tailoring: Slicing by Sequential Criteria  
*Yue Li, Tian Tan, Yifei Zhang, and Jingling Xue* ................................ 15:1–15:28
Composing Interfering Abstract Protocols
  Filipe Militão, Jonathan Aldrich, and Luís Caires .......................... 16:1–16:26

The Elements of Decision Alignment
  Mark S. Miller and Bill Tulloh .................................................. 17:1–17:5

A Calculus with Partially Dynamic Records for Typeful Manipulation of JSON Objects
  Atsushi Ohori, Katsuhiro Ueno, Tomohiro Sasaki, and Daisuke Kikuchi .... 18:1–18:25

Higher-Order Demand-Driven Program Analysis
  Zachary Pulner and Scott F. Smith ............................................. 19:1–19:25

Scopes Describe Frames: A Uniform Model for Memory Layout in Dynamic Semantics
  Casper Bach Poulsen, Pierre Néron, Andrew Tolmach, and Eelco Visser ..... 20:1–20:26

Lightweight Session Programming in Scala
  Alceste Scalas and Nobuko Yoshida ........................................... 21:1–21:28

Boomerang: Demand-Driven Flow- and Context-Sensitive Pointer Analysis for Java

Transactional Tasks: Parallelism in Software Transactions
  Janwillem Swalens, Joeri De Koster, and Wolfgang De Meuter ................ 23:1–23:28

Staccato: A Bug Finder for Dynamic Configuration Updates
  John Toman and Dan Grossman .................................................. 24:1–24:25

Transforming Programs between APIs with Many-to-Many Mappings
  Chenglong Wang, Jiajun Jiang, Jun Li, Yingfei Xiong, Xiangyu Luo, Lu Zhang, and Zhenjiang Hu ................................................. 25:1–25:26

Towards Ontology-Based Program Analysis
  Yue Zhao, Guoyang Chen, Chunhua Liao, and Xipeng Shen .................... 26:1–26:25
ECOOP continues to evolve. It has come a long way from its “object-oriented” roots (and it has even, once, traveled a long way from its European roots). It is difficult to pin down exactly what belongs in ECOOP, yet I believe many attendees feel there is something distinctive (and valuable) about the conference.

Part of its distinction is in the format: not just that it is in Europe in the summer, but that it continues to hew to a single track with a room of informed and attentive listeners, an experience that has largely vanished in the rest of the programming and programming languages world. But I believe there is also something identifiable about its content.

Call for Papers

In preparing this year’s Call for Papers, I did a small analysis of the calls from the past several years. The result was (at least to me) amusing, and can be seen here: https://github.com/shriram/ecoop-cfps

Program chairs, it appears, cannot help but chop and change the call, with most of their attention devoted to the laundry list of topics. Well, I could not resist it either, but I also believe our conference calls would be greatly improved by removing these laundry lists and replacing them with reasonably crisp, non-vacuous, non-trivial statements of purpose. To that end, I coined the following:

[ECOOP’s] primary focus has been object-orientation, though it is liberal in its taste and, in recent years, has accepted quality papers over a much broader range of programming language and programming topics. Its sweet spot tends to be the theory, design, implementation, optimization, and analysis of programming languages that enable or enforce abstractions—data, control, security, performance—across various programming styles, from object-orientation to reactivity to spreadsheets. It encourages both innovative and creative solutions to real problems, and evaluations of existing solutions in ways that shed new insights. Following recent precedent, it also encourages the submission of reproduction studies.

I look forward to seeing what future chairs will make of it.

Submission Date

This year, we also moved ECOOP’s submission deadline earlier. ECOOP has long set its date in reaction to when ESOP’s notifications—rejections, specifically—come out. But I felt having a deadline just a few days later suggests that the feedback from ESOP can in fact be attended to that quickly, which quite often is false—thereby disrespecting the hard work of the ESOP reviewers, and pushing the community towards a “dart-throwing” approach to paper submissions. Waiting for ESOP also pushed a non-trivial load of work to the winter break period at the end of the year (around Christmas and other festivities), which felt improper to impose on PC members who are, after all, volunteers.

Therefore, ECOOP had its deadline before ESOP’s responses. This almost certainly contributed to a significant drop in submissions—we had only 79—but interestingly, the size of the final accepted paper list was not really smaller than usual, nor was there any perception of a drop in quality. Perhaps not waiting for rejected papers is not such a problem.
after all, except inasmuch as it fails to boost the denominator of the acceptance rate, affecting “prestige”.

Reviewing

Thanks to the smaller number of submissions, we were able to lavish attention on the papers. No paper (with the exceptions below) received fewer than three reviews, of course, but many papers received five or even six. Because nobody had more than ten papers to review, the reviewers put a very serious effort into it, and produced outstanding work. Just about every reviewer produced a useful set of questions for authors to answer and then took their responses seriously. A later survey indicated significant satisfaction from authors, even of rejected papers. I doubt papers have been as thoroughly reviewed for any conference in recent years.

We tried a new-ish format that was only partially successful. The idea was that, in the two weeks after the submission deadline (finishing before Christmas), we would run a “kick the tires” round (inspired by what Blackburn and Hauswirth put in place for artifacts). Each paper would get two PC reviewers, and their job was to:

- Check for anonymity failures.
- Identify other reviewers.
- Identify potential conflicts of interest.
- Confirm that the paper was a submission worthy of full reviewing.
- Determine if their interest was reduced now that they had seen the paper, so we could find other reviewers.
- Inform the chair if they spotted any other issues.

Some of these goals were indeed achieved. Multiple reviewers came across papers that were not what they had expected from the title and abstract, and were hence significantly less interested in. Sometimes these problems are only discovered during the very last few days of the review period; this made sure that such problems were (partially) detected in the first few days instead, and reviewers were re-allocated elsewhere.

Other goals did not succeed as much. A few anonymization failures were discovered early, and we were able to get fixed versions of papers before regular reviewing began. But several were missed during this round and only uncovered later.

Finally, for non-viable papers, once there was unanimous agreement between the two assigned reviews and me, in lieu of regular reviews I wrote a generic chair’s response. This enabled reviewers to focus their energy on papers worth their attention. Both at this ECOOP and at last year’s Onward!, where I did something similar, this somewhat backfired. Sometimes the authors of papers that are rejected early are the least aware of how reviewing works, and are liable to get upset and badger chairs about due process, the nature of science, and so on. Having done this twice, I’ve learned a lesson: let the papers just get three short reviews and don’t try to save time. In the long run, it costs more time than it saves.

PC Meeting

In keeping with ECOOP tradition, we had a live PC meeting. I was not initially a big fan of the idea: I’m not sure how much live meetings accomplish, and they also seem to impose big costs. Therefore, I asked on social media, and was surprised by the strong support for a live meeting (and vociferous opposition to doing things electronically). I also polled my potential PC members, and they too overwhelmingly voted in favor of a live meeting.
The meeting took one day, and was followed by a 2.5 day workshop featuring PC speakers. I hosted the attendees at Brown, which is just outside Boston, MA, so the PC workshop had attendees from the greater Boston area attend. I believe the meeting and workshop were a success.

Outcome

One thing the PC quickly agreed on is that authors have a tendency to inflate claims about their work. I believe this is a natural consequence of the punishing standards that PCs set; authors therefore feel it essential to present their results as acts of perfection, rather than as they actually are: works in progress. But this complicates the paper record, and forces later authors to compare against what might be exaggerated or even irrelevant claims.

We therefore agreed that we would be liberal in shepherding papers. This is not common in programming languages conferences, and can only work with PC members who are willing to commit to doing the extra work after the date they thought their service would be over; happily, this PC was very willing to perform this extra work. (On the other hand, in some communities it is standard for all papers to be assigned a shepherd.) Therefore, we accepted only ten papers outright (with the usual expectation that authors will make some revisions, but not a checked, formal requirement that they do so). In contrast, sixteen papers were sent to shepherding.

Of the sixteen, fifteen passed muster, most of them quite quickly and easily. One paper had repeated problems, and I decided the PC had already put in too much effort without a clear end in sight. Therefore, that paper was rejected, leaving us with 25 accepted out of 79. (Incidentally, that one rejected paper also had non-trivial problems found by the Artifact Evaluation Committee. It is unclear what would have happened if our shepherd had not caught the issues the artifact raised.)

Conclusion

It is always healthy to ask whether our ongoing activities are viable and worthwhile. I’m happy to say that I believe ECOOP is. It provides a distinctive, high-quality venue, and the surrounding constellation of activities—such as the summer school, CurryOn, workshops, etc.—have given it a strong supporting context. The conference is healthy and lively.

Many thanks to my supporting team at Brown, who ran the PC meeting and workshop: Jack Wrenn, Justin Pombrio, Hannah Quay-de la Vallee, Tim Nelson, Kate Correia, and Lauren Clarke. Ben Lerner has handled assembling the proceedings with saintly patience. Jan Vitek was an endless source of gnomic wisdom. Camil Demetrescu, Emilio Coppa, and Daniele Cono D’Elia have made various things that should have been hard startlingly easy. Beppe Castagna, Richard Jones, and Sophia Drossopoulou fielded numerous questions as prior chairs, providing responses not only wise but also laced with wit. Finally, the AITO SC was encouragingly positive about various proposals. A conference that can attract this many accomplished people to run it with passion has a bright future indeed.

Shriram Krishnamurthi
Providence, RI, USA
2016-05-29
List of Authors

Jonathan Aldrich  
Carnegie Mellon University  
Pittsburg, PA, USA  
jonathan.aldrich@cs.cmu.edu

Satish Chandra  
Samsung Research America  
Mountain View, CA, USA  
schandra@samsung.com

Karim Ali  
TU Darmstadt  
Darmstadt, Germany  
karim.ali@cased.de

Guoyang Chen  
North Carolina State University  
Raleigh, NC, USA  
gychen1991@gmail.com

Esben Andreasen  
Aarhus University  
Aarhus, Denmark  
esbena@cs.au.dk

Sheng Chen  
UL Lafayette  
Lafayette, LA, USA  
chen@louisiana.edu

Pavel Avgustinov  
Semmle  
Oxford, England  
pavel@semmle.com

Maxime Chevalier-Boisvert  
Université de Montréal  
Montréal, Canada  
maximechevalierb@gmail.com

Edd Barrett  
King’s College London  
London, England  
edward.barrett@kcl.ac.uk

Joeri De Koster  
Vrije Universiteit Brussel  
Brussels, Belgium  
jdekooste@vub.ac.be

Eric Bodden  
Paderborn University & Fraunhofer IEM  
Paderborn, Germany  
eric.bodden@uni-paderborn.de

Wolfgang De Meuter  
Vrije Universiteit Brussel  
Brussels, Belgium  
wdmeuter@vub.ac.be

Carl Friedrich Bolz  
King’s College London  
London, England  
cfbolz@gmx.de

Lukas Diekmann  
King’s College London  
London, England  
lukas.diekmann@gmail.com

Kim Bruce  
Pomona College  
Pomona, CA, USA  
kim@cs.pomona.edu

Jens Dietrich  
Massey University  
Palmerston North, New Zealand  
j.b.dietrich@massey.ac.nz

Luis Caires  
Universidade Nova de Lisboa  
Lisbon, Spain  
lcaires@fct.unl.pt

Martin Erwig  
Oregon State University  
Corvallis, OR, USA  
erwig@oregonstate.edu

Elias Castegren  
Uppsala University  
Uppsala, Sweden  
elias.castegren@it.uu.se

Jonathan Eyolfson  
University of Waterloo  
Waterloo, Ontario, Canada  
jeyolfson@uwaterloo.ca

30th European Conference on Object-Oriented Programming (ECOOP 2016).  
Editors: Shriram Krishnamurthi and Benjamin S. Lerner  
Leibniz International Proceedings in Informatics  
Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany
Marc Feeley
Université de Montréal
Montréal, Canada
feeley@iro.umontreal.ca

Luminous Fennell
University of Freiburg Freiburg, Germany
fennell@informatik.uni-freiburg.de

Yossi Gil
Technion — Israel Institute of Technology
Haifa, Israel
yogi@cs.technion.ac.il

Colin S. Gordon
Drexel University
Philadelphia, PA, USA
csgordon@cs.drexel.edu

Danny M. Groenewegen
Delft University of Technology
Delft, Netherlands
d.m.groenewegen@tudelft.nl

Dan Grossman
University of Washington
Seattle, WA, USA
djg@cs.washington.edu

Daco C. Harkes
Delft University of Technology
Delft, Netherlands
d.c.harkes@tudelft.nl

Michael Homer
Victoria University of Wellington
Wellington, New Zealand
mwh@ecs.vuw.ac.nz

Zhenjiang Hu
National Institute of Informatics
Tokyo, Japan
hu@nii.ac.jp

Kamil Jezek
University of West Bohemia
Pilsen, Czech Republic
kjezek@kiv.zcu.cz

Jiajun Jiang
Peking University
Beijing, China
xgdsmileboy@gmail.com

Michael Peyton Jones
Semmle
Oxford, England
michael@semmle.com

Timothy Jones
Victoria University of Wellington
Wellington, New Zealand
tim@ecs.vuw.ac.nz

Jaakko Järvi
Texas A&M University
College Station, TX, USA
jarvi@cse.tamu.edu

Daisuke Kikuchi
Tohoku University and Hitachi Solutions
East Japan, Ltd.
Sendai, Japan
kikuchi@riec.tohoku.ac.jp

Darya Kurilova
Carnegie Mellon University
Pittsburg, PA, USA
darya@cs.cmu.edu

Patrick Lam
University of Waterloo
Waterloo, Ontario, Canada
patrick.lam@uwaterloo.ca

Tomer Levy
Technion — Israel Institute of Technology
Haifa, Israel
stlevy@campus.technion.ac.il

Jun Li
Peking University
Beijing, China
j.lee.pku23@gmail.com

Yue Li
UNSW Australia
Sydney, Australia
yueli@cse.unsw.edu.au

Chunhua Liao
Lawrence Livermore National Laboratory
Livermore, CA, USA
liao6@llnl.gov