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‹Programming› 2020 Companion

Conference Companion of the 4th International Conference on

Art, Science, and Engineering of Programming

Edited by:

Ademar Aguiar, Shigeru Chiba, and Elisa Gonzalez Boix

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Welcome from the Chairs

Welcome to the Companion Proceedings for the 4th International Conference on the Art, Science, and Engineering of Programming, named <Programming> 2020.

The International Conference on the Art, Science, and Engineering of Programming is a new conference focused on programming topics including the experience of programming. We have named it ‹Programming› for short. ‹Programming› seeks for papers that advance knowledge of programming on any relevant topic, including programming practice and experience.

To build a community and to foster an environment where participants can exchange ideas and experiences related to practical software development, ‹Programming› hosts several co-hosted events, including workshops, posters and the student research competition. This companion gathers all the papers for these events.

After Brussels, Nice, and Genova, this fourth edition was planned to be held in Porto, Portugal, March 23–26, 2020. Unfortunately, it did not take place due to the COVID-19 outbreak. However, several events still ran virtually including the Convivial Computing Salon (Salon 2020), the 4th International Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs 2020), and the 6th edition of the Programming Experience Workshop (PX/20).

We are grateful to AOSA, University of Porto, and the City of Porto for sponsoring <Programming> 2020, to ACM SIGPLAN and ACM SIGLOG for conferring the “in-cooperation-with” status, and to all the <Programming> 2020 Organizing and Steering Committee members for the preparation of the event in Porto, as well as its rollback due to the COVID-19 situation.

We want to thank also the Program Committee members and the reviewers of all co-hosted events for their efforts in evaluating the submissions. We especially wish to thank the authors of submitted papers for their support in such a special edition affected by the COVID-19 outbreak.

Elisa Gonzalez Boix and Shigeru Chiba
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1st International Workshop on ENgineering Intelligent Applications' Code (ENIAC 2020)

Artificial Intelligence is becoming a mainstream concern in everyday software construction. More and more software companies intend to leverage AI techniques in their products. However, there is a large gap between Programming/Software Engineering and Artificial Intelligence. "Adding intelligent behaviour" to an extensive modern software system is therefore currently more a craft than an engineering domain.

The International Workshop on ENgineering Intelligent Applications' Code, or **ENIAC 2020**, seeks to solve the problem by providing a forum for researchers and practitioners to share and discuss how software systems with an Artificial Intelligence core should be developed.

ENIAC 2020 received a total of 5 submissions that went through a rigorous reviewing process. Every submission received at least three reviews by the PC members, and was carefully discussed until a consensus was reached. All decisions were based solely on the quality of the submission and on the outcome of the discussion. The program committee accepted the two technical papers included in these proceedings, and the one presentation abstract. We hope that the authors of submissions that did not make it to the program will benefit from the reviewers' feedback.

We would like to thank all authors for the set of high-quality submissions, and the program committee for the careful review and discussion.

Wolfgang De Meuter, Coen De Roover, Dario Di Nucci
Workshop Co-Organizers

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- Michele Tufano, Microsoft, United States
- Tom Van Cutsem, Nokia Bell Labs, Belgium

2nd Interconnecting Code Workshop (ICW'20)

Welcome to the proceedings of the *2nd Interconnecting Code Workshop* (ICW'20). ICW'20 was planned to be co-located with <Programming> 2020 in Porto, Portugal, in late March, but was cancelled due to the situation around the COVID-19. The submissions are published none-the-less, after review by the program committee.

Modern computer systems are often loosely coupled compositions of heterogeneous components. An important part of modern programming is the art, science, and engineering of interconnecting disparate code components to offer larger services in a reliable and scalable manner. The goal of our workshop was to facilitate an ongoing discussion, and advance the state of the art of interconnecting code in particular.

We had 4 submissions: 2 short papers, and 2 extended abstracts. We accepted the short papers and 1 extended abstract. All submissions were reviewed by the program committee. Overall, we have seen a continuation of the discussion around polyglot programming in GraalVM, but also how we might go about logic programming in connection with the Swift programming language. Lastly, we got some insights from the German Aerospace Center (DLR) on how they combine tools specific to various engineering disciplines into high-level workflows.

We would like to thank our contributors for agreeing to share their work and insights. We hope that you too will find the proceedings thought-provoking. We encourage you to get in touch with the authors, to exchange further ideas, and advance the state of the art, science, and engineering of interconnecting code.

Eric Jul, Oleks Shturmov
June 2020 — ICW Program Chair and Co-Chair

Short Papers and Extended Abstracts

LogicKit: Bringing logic programming to Swift
Dimitri Racordon, Didier Buchs

Supporting the Composition of Domain-Specific Software via Task-Specific Roles (Extended Abstract)
Brigitte Boden, Robert Mischke, Alexander Weinert, Andreas Schreiber

User-defined Interface Mappings for the GraalVM
Alexander Riese, Fabio Niephaus, Tim Felgentreff, Robert Hirschfeld

ICW'20 Organization

Program Committee	Wolfgang De Meuter, Vrije Universiteit Brussel, Belgium Eric Jul, University of Oslo, Norway Oleks Shturmov, University of Oslo, Norway
Program Chairs	Eric Jul, University of Oslo, Norway Oleks Shturmov, University of Oslo, Norway (co-chair)

4th International Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs'20)

Welcome to the proceedings of the fourth Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs'20).

MoreVMs aims to bring together industrial and academic programmers to discuss the design, implementation, and usage of modern languages and runtimes. This includes aspects such as reuse of language runtimes, modular implementation, language design, and compilation strategies.

This year's workshop took a somewhat unconventional format. ‹Programming›'20 would have taken place in Porto, Portugal, in March and MoreVMs'20 would have been co-located. Due to the worldwide COVID-19 virus outbreak, however, neither ‹Programming› nor MoreVMs were run as traditional physical events. MoreVMs'20 was instead run as a virtual event over tele-conferencing.

MoreVMs'20 was the fourth edition of the workshop and continued in the spirit of previous editions: striving to enable an informal and diverse discussion on how languages and runtimes are currently being utilized, and where they need to improve further.

Presentation proposals were in the form of extended abstracts and, new this year, 400-word talk proposals. Submissions discussing experiences, work-in-progress, as well as future visions, from either an academic or industrial perspective were welcomed. The program committee was selected with the intention of having equal parts academic and industrial affiliations. We received 10 submissions, 9 of which were accepted. Four of these submissions were presented virtually, however all accepted submissions will be published.

MoreVMs'20 was lucky to have two virtual invited talks: Roman Kennke from Red Hat spoke about the second generation of Shenandoah GC, and Leszek Swirski from Google gave a talk on how to compile JavaScript in zero time.

Despite the event being virtual, it was surprisingly well attended. Attendees dropped in and out over the course of the event, but there were usually over 40 attendees throughout the online session. All talks from the virtual event were recorded and are available on our website at:

`https://2020.programming-conference.org/home/MoreVMs-2020`.

We would like to thank everyone, the authors, speakers, and attendees for bearing with us with the virtual event. We know that it is not the same as a physical meeting, but given the limitations, we feel it went well. We would also like to thank the program committee for reviewing our submissions. Thank you everyone.

Hopefully see you all *in-person* at MoreVMs'21!

Edd Barrett, Fabio Niephaus
May 2020 MoreVMs'20 Program Co-Chairs

Invited Talks

Compiling JavaScript in zero time*
Leszek Swirski, Google, Germany

Shenandoah GC 2.0
Roman Kennke, Red Hat, Germany

MoreVMs'20 Extended Abstracts

Enhancement of OpenJDK Biased Locking for Infrequent Lock Contention
Ting Wang, Michihiro Horie, Kazunori Ogata, Hao Chen Gui, Xiao Ping Guo and Yang Liu

Profiling Streams on the Java Virtual Machine
Edgar Eduardo Rosales Rosero, Andrea Rosà and Walter Binder

Running Parallel Bytecode Interpreters on Heterogeneous Hardware
Juan Fumero, Athanasios Stratikopoulos and Christos Kotselidis

Superoptimization of WebAssembly Bytecode
Javier Cabrera Arteaga, Shrinish Donde, Jian Gu, Orestis Floros, Lucas Satabin, Benoit Baudry and Martin Monperrus

Toward Presizing and Pretransitioning Strategies for GraalPython
Johannes Henning, Tim Felgentreff, Fabio Niephaus and Robert Hirschfeld

Towards Dynamic SQL Compilation in Apache Spark
Filippo Schiavio, Daniele Bonetta and Walter Binder

MoreVMs'20 Talk Proposals

Continuous Performance Tracking for Better "Everything"!
Stefan Marr

Renaissance: Benchmarking Suite for Parallel Applications on the JVM
Aleksandar Prokopec, Andrea Rosà, David Leopoldseder, Gilles Duboscq, Petr Tuma, Martin Studener, Lubomír Bulej, Yudi Zheng, Alex Villazón, Doug Simon, Thomas Würthinger and Walter Binder

Towards Modern Runtime Support for an Object-Based Distributed Programming Language
Oleks Shturmov

MoreVMs'20 Workshop Organization

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Clement Bera, Google Aarhus, Denmark
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Andy Wingo, Igalia, S.L.

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Fabio Niephaus,
Hasso Plattner Institute, University of Potsdam, Germany

1st International Workshop on New Interfaces for Programming (NIP 2020)

Interfaces for programming have remained mostly unchanged since long time. Usually, software engineers (SE) interact with IDEs through keyboards and mice, and text-based interfaces displayed on computer screens. The field of software visualization (SOFTVIS) investigates the use of visual properties to support software engineering tasks such as programming. More recently, researchers in the field have analyzed the impact of displaying visualizations in virtual and augmented reality (VR/AR). The use of immersive environments have shown not only positive effects on developers' user experience but also on user performance.

The *International Workshop on New Interfaces for Programming* (NIP) aims at gathering experts from *(1)* the SE community, *(2)* the SOFTVIS community, *(3)* the VR/AR community, and *(4)* the Arts community in order to breed cross-community new interfaces to support programming tasks. The workshop aims at providing a forum for researchers and practitioners from these mostly disconnected research communities.

We received 6 submissions: 3 full papers, 2 new ideas and early results papers, and 1 lightning talk. Full and short papers were peer-reviewed by 3 members of the program committee. The submitted lightning talk was assessed based on the suitability of the topic by the organizing committee. In the end, we accepted the 6 submissions. A keynote by Rainer Koschke from University of Bremen on "VR/AR Software Visualization is for Collaboration" is included in the program.

Unfortunately, scientific events had been greatly affectedly by the situation with COVID-19, and therefore, prevented the NIP 2020 workshop to happen. The accepted papers have been published, as originally planned, in the ACM DL as a proceeding companion of the hosting conference <Programming> 2020.

Thank you very much to paper authors for trusting on this event to disseminate you work. Also, we would like to thank the members of the program committee who provided authors with detailed reviews of their work.

The workshop can be found on the web at:

`https://2020.programming-conference.org/home/nip-2020`

Organizing Committee

- Alexandre Bergel, University of Chile, Chile
- Leonel Merino, University of Stuttgart, Germany

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- Roberto Minelli, Software Institute (USI), Switzerland
- Richard Müller, Universität Leipzig, Germany
- Takashi Ishio, Nara Institute of Science and Technology, Japan

May 2020

Alexandre Bergel
Leonel Merino
Organizing Committee

4th International Workshop on Programming Technology for the Future Web (ProWeb 2020)

Full-fledged **web applications** have become ubiquitous on desktop and mobile devices alike. Whereas "responsive" web applications already offered a more desktop-like experience, there is an increasing demand for "rich" web applications (RIAs) that offer collaborative and even off-line functionality—Google Docs being the prototypical example. Long gone are the days that web servers merely had to answer incoming HTTP request with a block of static HTML. Today's servers react to a continuous stream of events coming from JavaScript applications that have been pushed to clients. As a result, **application logic and data** is increasingly **distributed**. Traditional dichotomies such as "client vs. server" and "offline vs. online" are fading.

The 4th International Workshop on Programming Technology for the Future Web, or ProWeb20, is a forum for researchers and practitioners to share and discus new technology for programming these and future evolutions of the web.

ProWeb20 received a total of 7 submissions. Of these, one submission was not considered since no PDF was submitted by the given deadline. The six remaining submissions went through a rigorous reviewing process. Every submission received three reviews by the PC members, and was carefully discussed until a consensus was reached. All decisions were based solely on the quality of the submissions and on the outcome of the discussion; we did not target any minimum or maximum number of papers to be accepted. The program committee accepted two technical papers to be included in these proceedings, and three presentation abstracts available on the website of the workshop. The one paper which was not accepted as a full paper was offered a talk slot.

Unfortunately, the COVID-19 outbreak has prevented the regular "physical" execution of the workshop. Because the safety and well-being of conference participants was our priority, we decided to not hold the workshop as planned. Nevertheless, we would like to thank all authors for submitting a set of high-quality submissions, and the program committee for their careful review and discussion of every submission.

Andrea Stocco (Università della Svizzera italiana)
Simon Fowler (University of Edinburgh)
Workshop Co-Organizers

Program Committee

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Gabriel Radanne	University of Freiburg	Germany
Filippo Ricca	Università degli Studi di Genova	Italy
Pascal Weisenburger	Technische Universität Darmstadt	Germany

6th International Workshop on Programming Experience (PX/20)

The *Programming Experience (PX) Workshop* is about what happens when programmers sit down in front of computers and produce code, especially in an exploratory way. Do they create text that is transformed into running behavior (the old way), or do they operate on behavior directly ("liveness"); are they exploring the live domain to understand the true nature of the requirements; are they like authors creating new worlds; does visualization matter; is the experience immediate, immersive, vivid and continuous; do fluency, literacy, and learning matter; do they build tools, meta-tools; are they creating languages to express new concepts quickly and easily; and curiously, is joy relevant to the experience?

Correctness, performance, standard tools, foundations, and text-as-program are important traditional research areas, but the experience of programming and how to improve and evolve it are the focus of this workshop. In this edition we focused on live, exploratory programming, but also welcomed a wide spectrum of contributions on programming experience.

PX/20 was the 6th edition and the first online-version of the workshop: Participants met virtually, authors presented their work in lightning talks, and everyone engaged in lively discussions that extended beyond the end of the scheduled time.

Our post-workshop proceedings allowed authors to reflect on the feedback they got from the program committee and the workshop participants and improve their submission.

We would like to thank our program committee, all workshop attendees, and most importantly our authors for their contributions, constructive criticism, hard work, and willingness to share their ideas.

—Luke Church, Richard P. Gabriel, Hidehiko Masuhara, and Robert Hirschfeld

Papers

Multiagent Live Programming Systems: Models and Prospects for Critical Applications.
Steven L. Tanimoto

MATLAB Doesn't Love Me.
Tijs van der Storm and Geor Bakker

Towards a Pattern Language for Interactive Coding Tutorials.
Tao Dong and Gale Yang

Polyglot Code Finder.
Jan Ehmueller, Alexander Riese, Hendrik Tjabben, Fabio Niephaus, and Robert Hirschfeld

Visual Design for a Tree-oriented Projectional Editor.
Tom Beckmann, Stefan Ramson, Patrick Rein, and Robert Hirschfeld

Javardise: A Structured Code Editor for Programming Pedagogy in Java.
André L. Santos

Presentations

Live Metrics Visualization for Software Improvement.
Sara Fernandes, André Restivo, Hugo Sereno Ferreira, and Ademar Aguiar

Towards Wide-Spectrum Computing.
Enzo Alda and Javier Lopez Lombano

Live Programming Support for Halide Scheduling Strategies.
Yuka Takahashi, Jonathan Ragan-Kelley, Tsukasa Fukusato, Jun Kato, and Takeo Igarashi

A Survey on the Liveness of Refactoring Towards Energy Efficiency.
Emanuel Fernando da Silva Moreira, Filipe Figueiredo Correia, and João Bispo

Web

http://programming-experience.org/px20/
https://2020.programming-conference.org/home/px-2020/

Program Committee

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Richard P. Gabriel, Dreamsongs and Hasso Plattner Institute, California
Robert Hirschfeld, Hasso Plattner Institute, University of Potsdam, Germany
Hidehiko Masuhara, School of Computing, Tokyo Institute of Technology, Japan

Convivial Computing Salon

It is our pleasure to welcome you to the proceedings of the *Convivial Computing Salon* at <PROGRAMMING> '20.

The Salon continues in the footsteps of the previous three Salon des Refusés workshops at the <PROGRAMMING> conference. The goal is still to provide space for unorthodox, thought-provoking ideas that question and expand what programming research should be about. To this end, we request papers that can provoke interesting discussions among the audience, rather than evaluating papers by their use of proofs, measurements, or controlled user studies.

In *Tools for Conviviality*, Ivan Illich criticized the damage to society from technology escalation. The Convivial Computing Salon invited investigations from this perspective on computing technology. As the Call for Papers says: we were promised bicycles for the mind, but we got aircraft carriers instead.

Each submitted paper was reviewed by four program committee members, and accepted papers were presented along with a critique that presents an alternative position, develops additional context, or summarizes discussion about the work.

Because of the COVID-19 pandemic the conference to be held in Porto, Portugal was cancelled, and instead the Salon was held online from May 3-9 2020. Links to slides and recordings can be found at `https://docs.google.com/spreadsheets/d/1tuyRit9qQN1kwckS3rND8GmvSKPo-qBJW8aroEIwFt8/edit#gid=0`.

We hope that this years' papers and critiques inform and inspire our readers and future research. We would like to thank the authors and presenters for their submissions and the program committee for their thoughtful and constructive reviewing.

Luke Church, Colin Clark, Jonathan Edwards
June 2020 — Salon Program Co-Chairs

Papers

Wildcard: Spreadsheet-Driven Customization of Web Applications
Geoffrey Litt and Daniel Jackson
Response by Mariana Mărășoiu

Towards a Dynamic Multiscale Personal Information Space: Beyond Application and Document Centered Views of Information
Amy Rae Fox, Philip Guo, Clemens Nylandsted Klokmose, Peter Dalsgaard, Arvind Satyanarayan, Haijun Xia, and James D. Hollan
Response by Luke Church

Convivial Design Heuristics for Software Systems
Stephen Kell
Response by Jonathan Edwards

Rethinking Programming "Environment": Technical and Social Environment Design toward Convivial Computing
Jun Kato and Keisuke Shimakage
Response by Philip Tchernavskij

Spreadsheets as Notational Environment for Paper Weaving
Jonathan Skjøtt
Response by Max Krieger

Can Programmers Escape the Gentle Tyranny of Call/Return?
Marcel Weiher
Response by Stephen Kell

Bicycles for the Mind Have to Be See-Through
Kartik Agaram
Response by Tomas Petricek

Escaping the Prison of Style
Antranig Basman and Philip Tchernavski
Response by Colin Clark

What It Takes to Create with Domain-Appropriate Tools: Reflections on Implementing the "Id" System
Joel Jakubovic
Response by Clemens Klokmose

Chatting with Glue: Cognitive Tools for Augmented Conversation
Max Krieger
Response by Jonathan Skjøtt

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Katherine Ye, Carnegie Mellon University, CMU
Tijs van der Storm, CWI & University of Groningen, NL

Program Chairs

Luke Church, University of Cambridge, UK
Colin Clark, OCAD University, CA
Jonathan Edwards, USA

Poster Session of ‹Programming› 2020

Welcome to the posters session at ‹Programming› 2020. Posters are an integral part of the conference and aim at showcasing very recent or ongoing work, clarifying problem statements, vetting solutions, or identifying evaluation methods in an interactive way. They are an excellent opportunity for authors to receive feedback from the ‹Programming› community and encourage one-to-one and small group discussions on a technical topic.

This year, the call for posters attracted 6 submissions, half of which pertaining to papers accepted to other ‹Programming› 2020 tracks. The other half were accompanied by a two-page extended abstract and report early and ongoing works. Two of these submissions were accepted for inclusion in these proceedings:

Helping Software Developers through Live Software Metrics Visualization
Sara Fernandes, André Restivo, Hugo S. Ferreira, Ademar Aguiar

Overviewing the Liveness of Refactoring for Energy Efficiency
Emanuel Moreira, Filipe F. Correia, João Bispo

All the submitted posters were allowed to be presented at the conference. Even though the 2020 edition in Porto could not physically take place due to the COVID-19 pandemic, these posters were made available at the conference website and social networks to promote visibility and discussion around the works.

Thank you all poster authors, and keep on ‹Programming›!

Porto
May 2020

Filipe F. Correia and Hidehiko Masuhara
‹Programming› 2020 Poster Chairs

<Programming> 2020
Student Research Competition (SRC)

We are delighted to present the presentation abstracts accepted for the first round of the ACM Student Research Competition (SRC) of the fourth International Conference on the Art, Science and Engineering of Programming (<Programming> 2020). Our call for submissions welcomed research results from undergraduate and graduate ACM student members on any of the areas covered by the conference. We received a total of 8 submissions which, in the spirit of the competition, each received three lightweight and constructive reviews from the members of the program committee.

We would like to thank the members of the program committee for evaluating the submitted presentation abstracts:

- Nada Amin (Harvard University, USA)
- Matthew Flatt (University of Utah, USA)
- Yu David Liu (State University of New York (SUNY) Binghamton, USA)
- Hidehiko Masuhara (Tokyo Institute of Technology, Japan)
- Luca Padovani (University of Turin, Italy)

Nanette Hernández provided excellent administrative support on the side of ACM. Last but not least, we are grateful to Ademar Aguiar, General Chair of <Programming> 2020, for his organizational support and to Robert Hirschfeld, member of the Steering Committee, for the invitation to organize the student research competition.

Coen De Roover and Philipp Haller
June 2020 Co-Chairs ACM SRC at <Programming> 2020

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