

Jahresbericht 2021

Fachgebiet Software-Architekturen

Prof. Dr. Robert Hirschfeld



Hasso-Plattner-Institut
Digital-Engineering-Fakultät
Universität Potsdam

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<https://www.hpi.uni-potsdam.de/swa>

28. Februar 2022

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1 Personelle Zusammensetzung

Leiter des Fachgebiets

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marcel.weiher@hpi.uni-potsdam.de
(0331) 5509-217

Gastwissenschaftlerinnen und Gastwissenschaftler

Prof. Dr. Harumi Watanabe
Tokai University, Tokio, Japan
harumi-w@tsc.u-tokai.ac.jp

Dr. Carl Friedrich Bolz-Tereick
Heinrich-Heine-Universität Düsseldorf
cfbolz@gmx.de

Dr. Tim Felgentreff
Oracle Labs, Potsdam, Germany
tim.felgentreff@hpi.uni-potsdam.de
(0331) 5509-543

Richard P. Gabriel, Ph.D.
Dreamsongs, Redwood City, California, USA
rpg@dreamsongs.com

Tutorinnen, Tutoren und studentische Hilfskräfte

Tarik Alnawa
Leon Bein
Joana Bergsiek
Tom Braun
Johanna Dahlkemper
Rieke Freund
Henrik Guhl
Yannis Hofmann
Theresa Hradilak
Paula Klinke
Eva Krebs
Stephan Lutz
Leon Matthes
Paul Methfessel
Felix Roth
Ole Schlüter
Christoph Thiede
Clemens Tiedt
Silvan Verhoeven
Tobias Zagorni

2 Lehrveranstaltungen

Wintersemester 2021/2022 (18 SWS)

Programming Experience (4 SWS, Projektseminar, Master)

Robert Hirschfeld, Jens Lincke, Marcel Taeumel, Patrick Rein, Eva Krebs, Stefan Ramson, Tom Beckmann

Software Architecture (4 SWS, Vorlesung, Bachelor)

Robert Hirschfeld, Patrick Rein, Eva Krebs, Marcel Taeumel, Jens Lincke

Visual Abstractions for Framework, Tool, and Language Design (4 SWS, Projektseminar, Master)

Robert Hirschfeld, Tom Beckmann, Marcel Taeumel, Jens Lincke, Stefan Ramson, Patrick Rein, Toni Mattis, Fabio Niephaus

Graduate School Research Seminar (2 SWS, Forschungskolleg)

Andreas Polze, Robert Hirschfeld

Exploring Visual Primitives for Authoring Source Code (2 SWS, Masterprojekt)

Robert Hirschfeld, Tom Beckmann, Marcel Taeumel

Wenn den Bildern die Worte fehlen (2 SWS, Bachelorprojekt)

Robert Hirschfeld, Jens Lincke, Tom Beckmann

Sommersemester 2021 (16 SWS)

Live Programming (4 SWS, Projektseminar, Master)

Robert Hirschfeld, Jens Lincke, Patrick Rein, Marcel Taeumel, Toni Mattis, Stefan Ramson, Tobias Pape

Software Design (4 SWS, Projektseminar, Master)

Robert Hirschfeld, Jens Lincke, Patrick Rein, Marcel Taeumel, Toni Mattis, Stefan Ramson, Tobias Pape

Software Engineering 1 (4 SWS, Vorlesung, Bachelor)

Robert Hirschfeld, Jens Lincke, Patrick Rein, Marcel Taeumel, Toni Mattis, Stefan Ramson, Tobias Pape

2 Lehrveranstaltungen

Graduate School Research Seminar (2 SWS, Forschungskolleg)
Andreas Polze, Robert Hirschfeld

Tool Support for Collaborative Creation of Interactive Storytelling Media (2 SWS, Bachelorprojekt)
Robert Hirschfeld, Jens Lincke, Patrick Rein, Stefan Ramson, Marcel Taeumel

Wintersemester 2020/2021 (16 SWS)

Introduction to Programming Technology 1 (4 SWS, Vorlesung, Bachelor)
Robert Hirschfeld, Tom Beckmann, Toni Mattis, Tobias Pape

Programming Language Concepts, Tools, and Environments (4 SWS, Projektseminar, Master)
Robert Hirschfeld, Marcel Taeumel, Toni Mattis, Patrick Rein, Fabio Niephaus, Jens Lincke, Stefan Ramson

Software Architecture (4 SWS, Vorlesung, Bachelor)
Robert Hirschfeld, Patrick Rein, Marcel Taeumel, Jens Lincke, Fabio Niephaus, Stefan Ramson

Graduate School Research Seminar (2 SWS, Forschungskolleg)
Andreas Polze, Robert Hirschfeld

Tool Support for Collaborative Creation of Interactive Storytelling Media (2 SWS, Bachelorprojekt)
Robert Hirschfeld, Jens Lincke, Patrick Rein, Stefan Ramson, Marcel Taeumel

3 Promotionsvorhaben

Abgeschlossene Promotionsvorhaben

Fabio Niephaus (eingereicht)

Exploratory Tool-building Platforms for Polyglot Virtual Machines

Laufende Promotionsvorhaben

Tom Beckmann

Cross-Language, Efficient Block-based Programming

Eva Krebs

Concretizing Abstract Code With Example Mining

Toni Mattis

Supporting Program Comprehension Through Semantic Code Models

Eliot Miranda (extern)

Register Allocation in the Context of Sista/Scorch

Stefan Ramson

Active Expressions as a Basic Building Block for Reactive Programming Concepts

Patrick Rein

Ubiquitous Feedback Through Example-based Live Programming in the Babylonian Programming System

Marcel Weiher (extern)

Linguistic Architectural Support for Interactive Software

4 Abschlussarbeiten

Masterarbeiten

Eva Krebs

Example Mining for Babylonian Programming

Betreuer: Robert Hirschfeld, Patrick Rein

Christian Flach

Call Graphs für Live Programming: Call Tracing implementiert in Babylonian/S basierend auf einem Überblick von Techniken zur Datenextraktion für Dynamische Analyse

Betreuer: Robert Hirschfeld, Patrick Rein

Bachelorarbeiten

Paula Klinke

Tool Support for Collaborative Creation of Interactive Storytelling Media | Introduction to Scrollytellings as Interactive Media

Betreuer: Robert Hirschfeld, Jens Lincke, Patrick Rein

Silvan Verhoeven

Tool Support for Collaborative Creation of Interactive Storytelling Media | Design Constraints and Requirements for Scrollytelling Creation Tools

Betreuer: Robert Hirschfeld, Jens Lincke, Patrick Rein

Felix Roth

Tool Support for Collaborative Creation of Interactive Storytelling Media | Design and Implementation of an Editor for Scrollytellings in lively.next

Betreuer: Robert Hirschfeld, Jens Lincke, Patrick Rein

Linus Hagemann

Tool Support for Collaborative Creation of Interactive Storytelling Media | Animating Content in qinoq Scrollytellings

Betreuer: Robert Hirschfeld, Jens Lincke, Patrick Rein

Tarik Alnawa

Tool Support for Collaborative Creation of Interactive Storytelling Media | Evaluating qinoq Regarding the Creation of Scrollytellings on an Example

Betreuer: Robert Hirschfeld, Jens Lincke, Patrick Rein

5 Master- und Bachelorprojekte

Masterprojekt 2021/2022

Exploring Visual Primitives for Authoring Source Code

In computer programs, algorithms are usually implemented with textual code, even though there might be a better, often visual representation. When trying to understand such an algorithm, we thus often avoid looking at textual code, but develop a visual representation on paper or whiteboard.

In this project, students explore domains that take advantage of visual representations of code to build a framework allowing for rapid and easy creation of visual, executable representations of code. We aim for a programming environment where, rather than going to the whiteboard, programmers directly prototype their algorithms using visual primitives, means of combination, and means of abstraction provided by our framework and tools and, as they thus express executable code, get instant feedback from the system if their ideas will work in practice. Visual representations of algorithms coexist and integrate with the rest of the programmers' systems and tools.

The project will be based on Sandblocks, a research prototype of a block-based programming environment that is written in Squeak/Smalltalk. Students will collect and review visual primitives and workflows of existing visual programming environments in various domains, re-implement some of these visual primitives and corresponding visualizations in our block-based programming environment, and verify that the identified visual primitives can generalize by using them to implement visualizations of different domains.

Teilnehmer: Julian Berger, Michael Büßemeyer, Alexander Junger, Vincent Opitz, Gritta Weisheit

Betreuer: Robert Hirschfeld, Tom Beckmann, Marcel Taeumel

Bachelorprojekt 2021/2022

Wenn den Bildern die Worte fehlen: Das bebilderte Gedächtnis einer Stadt im Zusammenspiel mit Zeitzeuginnen und Zeitzeugen erschließen und erfahrbar machen

Bei der Erarbeitung von jahrzehntealten Bildarchiven, die häufig gemeinnützigen Organisationen als Spende überlassen werden, sind diese Organisationen auf Mithilfe der lokalen Zeitzeuginnen und Zeitzeugen angewiesen. Die Bad-Harzburg-Stiftung

verfügt über 20.000 analoge Bilder der Jahre 1945-1990, die nach und nach auf deren Website eingepflegt werden. Derzeit ist die Übersichtlichkeit des Online-Bildarchivs aber stark eingeschränkt und Besucherinnen und Besucher können Informationen, die sie zu den Bildern haben, nur über umständliche Wege beitragen.

Derzeit verfügbare Lösungen für die Verwaltung von Bildern fallen in der Regel in eines von zwei Extremen: soziale Plattformen wie Facebook oder Flickr erlauben es, Bilder zu teilen und Kommentare zu schreiben, aber sind nicht für große Archive oder eine kollaborative Katalogisierung gedacht. Lösungen wie Wikidata helfen, große Mengen an Informationen in wohldefinierte Strukturen einzupflegen, erfordern aber vergleichsweise viel Expertise und bieten keine eingebauten Lösungen für die Präsentation und Übersicht eingestellter Bilder an.

Im Rahmen dieses Projekts soll insofern eine Lösung für das Durchsuchen, Erkunden und Erfahren der Bilder durch Besucherinnen und Besucher geschaffen werden, Wege zum Crowdsourcing und Kuratieren von Bildern gefunden und ein besonderer Fokus auf die einfache Bedienbarkeit und den Austausch mit Nutzerinnen und Nutzern gelegt werden.

Partner: Werner Beckmann (Bad Harzburg Stiftung, Bad Harzburg)

Teilnehmer: Rieke Freund, Oliver Heß, Franziska Hradilak, Nils Lißner, Jan Philip Rätsch, Benedikt Vidic, Hendrik Wölert

Betreuer: Robert Hirschfeld, Jens Lincke, Tom Beckmann

Bachelorprojekt 2020/2021

Tool Support for Collaborative Creation of Interactive Storytelling Media

In this project, students will develop live tools and frameworks for cross-functional teams creating interactive storytelling content for the web, such as explorable explanations or scrollytelling. The resulting collaborative authoring tools will bring the perspectives of programmers, designers, and customers together in a single, web-based environment.

Part of the project will be: explore means for end-user programming of interactive applications and animations; design and implement a framework for expressing time- and scroll-position-dependent behavior in JavaScript supporting scrollytelling; design and implement an interactive editor in lively.next to author the structure, content, animations, and code of scrollytelling content; explore and understand the design process and communication patterns in teams creating interactive content; design and implement tools in lively.next to enable all design participants to review and discuss an interactive content directly from within the interactive.

Partner: Doreen Stahr, Robin Schreiber (Typeshift, Potsdam, Germany)

Teilnehmer: Tarik Alnawa, Linus Hagemann, Paula Klinke, Felix Roth, Silvan Verhoeven

Betreuer: Robert Hirschfeld, Jens Lincke, Patrick Rein, Marcel Taeumel, Stefan Ramson

6 Bearbeitete Forschungsthemen

Forschungsthemen

Software Modularity
Context-oriented Programming
Meta-level Architectures
Exploratory Programming
Live Programming
Babylonian Programming
Programming Languages
Polyglot Programming
Reactive Programming
Block-based Programming Environments
Virtual Machines and Execution Environments
Code Repository Mining
Statistical Code Repository Analysis and Machine Learning

Anwendungsbereiche

Education
End-user Development
Programming Environments and Tool Support
Design Thinking for Programming Activities
Cloud Programming Environments
Personal Productivity Programming

Technologien

Squeak/Smalltalk
LivelyKernel, JavaScript
Vivide, VivideJS
TruffleSqueak, GraalVM/Truffle, LSP, VS Code
RSqueak, PyPy
Gramada, Ohm
Babelsberg
Sandblocks
Home

7 Veröffentlichungen

Zeitschriften und Konferenzen (begutachtet)

Mauricio Verano Merino, Tom Beckmann, Tijs van der Storm, Robert Hirschfeld, and Jurgen Vinju. *Getting Grammars into Shape for Block-based Editors*. In Proceedings of the ACM Conference on Software Language Engineering (SLE) 2021, co-located with the Conference on Object-oriented Programming, Systems, Languages, and Applications (OOPSLA), Chicago, Illinois, USA, October 17-19, 2021, ACM DL.

Tom Beckmann, Eva Krebs, Patrick Rein, Stefan Ramson, and Robert Hirschfeld. *Shortening Feedback Loops in a Live Game Development Environment (Short Paper)*. In Proceedings of the IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC) 2021, St. Louis, Missouri, USA, October 10-13, 2021, IEEE.

Workshops (begutachtet)

Toni Mattis, Tom Beckmann, Patrick Rein, and Robert Hirschfeld. *First-class Concepts: Reifying Architectural Knowledge Beyond the Dominant Decomposition*. In Proceedings of the Virtual Workshop on Context-oriented Programming (COP) 2021, co-located with the European Conference on Object-oriented Programming (ECOOP), pages 9-15, Aarhus, Denmark, July 12, 2021, ACM DL.

Dominik Meier, Toni Mattis, and Robert Hirschfeld. *Toward Exploratory Understanding of Software Using Test Suites*. In Proceedings of the Programming Experience 2021 (PX/21) Workshop, companion volume to the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), co-located with the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), pages 60-67, Cambridge, UK, March 23, 2021, ACM DL.

Marcel Taeumel and Robert Hirschfeld. *Exploring Modal Locking in Window Manipulation: Why Programmers Should Stash, Duplicate, Split, and Link Composite Views*. In Proceedings of the Programming Experience 2021 (PX/21) Workshop, companion volume to the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), co-located with the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), pages 14-20, Cambridge, UK, March 23, 2021, ACM DL.

Monografien (begutachtet)

Tobias Pape. *Efficient Compound Values in Virtual Machines*. Doctoral Dissertation, 2021, Hasso Plattner Institute and University of Potsdam.

Buchkapitel

Marcel Taeumel, Patrick Rein, and Robert Hirschfeld. *Toward Patterns of Exploratory Programming Practice*. In Christoph Meinel and Larry Leifer (eds.). *Design Thinking Research: Translation, Prototyping, and Measurement*. Pages 127-150, Springer 2021.

Patrick Rein, Marcel Taeumel, and Robert Hirschfeld. *Towards a Theory of Factors that Influence Text Comprehension of Code Documents*. In Christoph Meinel and Larry Leifer (eds.). *Design Thinking Research: Interrogating the Doing*. Pages 307-325, Springer 2021.

Technische Berichte

Klara Seitz, Jens Lincke, Patrick Rein, and Robert Hirschfeld. *Language and Tool Support for 3D Crochet Patterns: Virtual Crochet With a Graph Structure*. HPI Technical Reports, vol. 137, 2021, Hasso Plattner Institute.

Wanda Baltzer, Theresa Hradilak, Lara Pfennigschmidt, Luc Maurice Prestin, Moritz Spranger, Simon Stadlinger, Leo Wendt, Jens Lincke, Patrick Rein, Luke Church, and Robert Hirschfeld. *An Individual-centered Approach to Visualize People's Opinions and Demographic Information*. HPI Technical Reports, vol. 136, 2021, Hasso Plattner Institute.

Sonstiges

Yu David Liu, Harumi Watanabe, Robert Hirschfeld, Atsushi Igarashi, and Hidehiko Masuhara. *COP-21 (Chairs' Welcome)*. In *Proceedings of the Workshop on Context-Oriented Programming and Advanced Modularity (COP) 2021*, co-located with the European Conference on Object-oriented Programming (ECOOP), Aarhus, Denmark, July 12, 2021, ACM DL.

7 Veröffentlichungen

Luke Church, Richard P. Gabriel, Hidehiko Masuhara, and Robert Hirschfeld. *PX/21 (Chairs' Welcome)*. In Proceedings of the Programming Experience 2021 (PX/21) Workshop, companion volume to the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), co-located with the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), pages viii-x, Cambridge, UK, March 23, 2021, ACM DL.

Fachgebiet Software-Architekturen. *Jahresbericht 2020*. Hasso-Plattner-Institut, Digital-Engineering-Fakultät, Universität Potsdam, 2021.

8 Vorträge auf Tagungen

Mauricio Verano Merino, **Tom Beckmann**, Tijs van der Storm, Robert Hirschfeld, and Jurgen Vinju. *Getting Grammars into Shape for Block-based Editors*. In Proceedings of the ACM Conference on Software Language Engineering (SLE) 2021, co-located with the Conference on Object-oriented Programming, Systems, Languages, and Applications (OOPSLA), Chicago, Illinois, USA, October 17-19, 2021, ACM DL. (virtuell)

Tom Beckmann, Eva Krebs, Patrick Rein, Stefan Ramson, and Robert Hirschfeld. *Shortening Feedback Loops in a Live Game Development Environment (Short Paper)*. In Proceedings of the IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC) 2021, St. Louis, Missouri, USA, October 10-13, 2021, IEEE. (virtuell)

Toni Mattis, Tom Beckmann, Patrick Rein, and Robert Hirschfeld. *First-class Concepts: Reifying Architectural Knowledge Beyond the Dominant Decomposition*. In Proceedings of the Virtual Workshop on Context-oriented Programming (COP) 2021, co-located with the European Conference on Object-oriented Programming (ECOOP), pages 9-15, Aarhus, Denmark, July 12, 2021, ACM DL. (virtuell)

Toni Mattis and Robert Hirschfeld. *Lightweight Lexical Test Prioritization for Immediate Feedback*. International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩) 2021, Cambridge, UK, March 22-26, 2021, AOSA. (virtuell)

Dominik Meier, Toni Mattis, and Robert Hirschfeld. *Toward Exploratory Understanding of Software Using Test Suites*. In Proceedings of the Programming Experience 2021 (PX/21) Workshop, companion volume to the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), co-located with the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), pages 60-67, Cambridge, UK, March 23, 2021, ACM DL. (virtuell)

Marcel Taeumel and Robert Hirschfeld. *Exploring Modal Locking in Window Manipulation: Why Programmers Should Stash, Duplicate, Split, and Link Composite Views*. In Proceedings of the Programming Experience 2021 (PX/21) Workshop, companion volume to the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), co-located with the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), pages 14-20, Cambridge, UK, March 23, 2021, ACM DL. (virtuell)

8 Vorträge auf Tagungen

Fabio Niephaus. *Polyglot Programming with TruffleSqueak and GraalVM.* HPI-SAP Symposium, February 26, 2021 (virtuell)

Tom Beckmann. *Efficient Block-based Programming Interfaces to Support Integrated Tooling.* HPI-SAP Symposium, February 26, 2021 (virtuell)

9 Organisation von und Teilnahme an HPI-Workshops

Fall Retreat of the HPI Research Schools

2021-10-26..28

Potsdam, Germany

HPI-Stanford Design Thinking Research Workshop

2021-09-07..09

Potsdam, Germany (virtuell)

Gemeinsamer Workshop der Graduiertenkollegs

2021-05-31..06-01

Schloss Dagstuhl, Germany (virtuell)

15th HPI Research Symposium

2021-04-19..23

Hasso Plattner Institute, Potsdam, Germany

HPI-Stanford Design Thinking Research Workshop

2021-03-15..17

Stanford, California, USA (virtuell)

HPI-SAP Graduate School Workshop

2021-02-26

Berlin & Walldorf, Germany (virtuell)

10 Vorträge von Gästen des Fachgebiets

Eva Krebs (Software Architecture Group, HPI)

Example Mining for Babylonian Programming

HPI – Tokyo Tech Joint Research Seminar (virtuell)

2021-05-14

Bernat Romagosa (SAP Research, Germany) and John Maloney (MIT Media Lab)

MicroBlocks: Small, Fast, Human Friendly

HPI – SWA – SAP – Snap! Joint Research Seminar (virtuell)

2021-04-28

Jadga Hügler (SAP Research, Germany)

TurtleStitch

HPI – SWA – SAP – Snap! Joint Research Seminar (virtuell)

2021-03-12

Fabio Niephaus (Software Architecture Group, HPI)

Polyglot Programming With TruffleSqueak

HPI – SWA – SAP – Snap! Joint Research Seminar (virtuell)

2021-02-19

Patrick Rein and Jens Lincke (Software Architecture Group, HPI)

Babylonian Programming

HPI – SWA – SAP – Snap! Joint Research Seminar (virtuell)

2021-02-05

Jens Mönig, Bernat Romagosa, and Jadga Hügler (SAP Research, Germany)

Snap! Hyper Blocks

HPI – SWA – SAP – Snap! Joint Research Seminar (virtuell)

2021-01-29

11 Partner

Africa's Voices Foundation
<https://www.africasvoices.org>

Bad Harzburg Stiftung, Bad Harzburg, Germany
<https://bad-harzburg-stiftung.de>

Bedarra Research Labs, Ottawa, Ontario, Canada
<https://www.bedarra.org>

DOCOMO Euro-Labs, Munich, Germany
<https://www.docomoeurolabs.de>

Dreamsongs, Redwood City, California, USA
<https://www.dreamsongs.com>

eXXcelent solutions, Ulm, Germany
<https://www.exxcelent.de>

GemTalk Systems, Beaverton, Oregon, USA
<https://www.gemtalksystems.com>

graphicore, Fürth, Germany
<https://www.graphicore.de>

HARC, Y Combinator Research, San Francisco, California, USA
<https://harc.ycr.org/member>

impara, Magdeburg, Germany
<https://www.impara.de>

Industrial Design Institute, Magdeburg, Germany
<https://www.gestaltung.hs-magdeburg.de>

Instantiations, Raleigh, North Carolina, USA
<https://www.instantiations.com>

Kyoto University, 京都大学, Kyoto, Japan
<https://www.kyoto-u.ac.jp>, <https://www.sato.kuis.kyoto-u.ac.jp>

Kyushu University, 九州大学, Fukuoka, Japan
<https://www.kyushu-u.ac.jp>

Oracle Labs Potsdam, Germany
<https://labs.oracle.com>

Oracle Labs Redwood Shores, CA, USA
<https://labs.oracle.com>

Oracle Labs Zurich, Switzerland
<https://labs.oracle.com>

SAP Innovation Center, Potsdam, Germany
<https://icn.sap.com>

SAP Knowledge and Education, Walldorf, Germany
<https://www.sap.com>

SAP Palo Alto Research Center, Palo Alto, California, USA
<https://www.sap.com>

SEC-i SmartEnergy Control Initiative, Ilmenau, Germany
<https://www.sec-i.org>

Stanford University, Center for Design Research, Palo Alto, California, USA
<https://www.cdr.stanford.edu>

Steinmayr Net Intelligence, Bergisch Gladbach, Germany
<https://www.steinmayr.de>

Sun Microsystems Laboratories, Menlo Park, California, USA
<https://research.sun.com>

Technische Universität Darmstadt, Darmstadt, Germany
<https://www.stg.tu-darmstadt.de>

Teleplace, Redwood City, California, USA
<https://www.teleplace.com>

The University of Tokyo, 東京大学, Tokyo, Japan
<https://www.u-tokyo.ac.jp>, <https://www.csg.ci.i.u-tokyo.ac.jp>

Tokai University, 東海大学, Tokyo, Japan
<https://www.u-tokai.ac.jp>

Tokyo Institute of Technology, 東京工業大学, Tokyo, Japan
<https://www.titech.ac.jp>, <https://prg.is.titech.ac.jp>

Travis CI, Berlin, Germany
<https://travis-ci.com>

Typeshift, Potsdam, Germany
<https://typeshift.de>

University of Antwerp, Antwerp, Belgium
<https://www.win.ua.ac.be>

University of Bern, Bern, Switzerland
<https://www.iam.unibe.ch/~scg>

University of Koblenz-Landau, Koblenz, Germany
<https://softlang.wikidot.com>

Viewpoints Research Institute, Glendale, California, USA
<https://www.vpri.org>

Vrije Universiteit Brussel, Brussels, Belgium
<https://soft.vub.ac.be>

VMware R&D, GemStone Systems, Beaverton, Oregon, USA
<https://www.gemstone.com>

Windward Solutions, Los Altos, California, USA
<https://www.windwardsolutions.com>

12 Open-Source-Projekte

Eigene Projekte

Lively4

A self-supporting web-based development environment that transfers Lively Kernel's live programming experience to newest web technology. By integrating Smalltalk-like tool support with Web Components and cloud storages, Lively4 encourages an exploratory style of programming and wiki-inspired collaboration between students.

<https://lively-kernel.org/lively4/lively4-core/start.html>

<https://github.com/LivelyKernel/lively4-core>

Vivide/VivideJS

A Squeak/Smalltalk-based programming environment and framework that supports low-effort construction of graphical tools by employing a data-driven perspective and a script-based programming model.

<https://github.com/hpi-swa/vivide>

<https://github.com/LivelyKernel/lively4-core/tree/gh-pages/src/client/vivide>

Squot and Squit

An object tracker for Squeak/Smalltalk allowing version control of arbitrary objects (Squot) with support for a Git backend (Squit) written Smalltalk.

<https://github.com/hpi-swa/Squot>

Polyglot Live Programming Support in Visual Studio Code

A Visual Studio Code extension that allows developers to use example-based live programming across multiple languages supported by the GraalVM.

<https://github.com/hpi-swa/polyglot-live-programming>

Ohm/S

A Squeak/Smalltalk implementation of the metaprogramming parser-generator framework Ohm.

<https://github.com/hpi-swa/Ohm-S>

Gramada

An interactive development environment for programming languages defined in Ohm. It is based on Vivide and implemented in Squeak/Smalltalk.

<https://github.com/hpi-swa/Gramada>

TruffleSqueak

A Squeak/Smalltalk virtual machine and polyglot programming environment for the GraalVM.

<https://github.com/hpi-swa/trufflesqueak>

Home Desktop System

A live, object-centric desktop system built on top of Squeak/Smalltalk. It is based upon the idea of representing data as living objects and allowing its users to adapt it to their needs without any restrictions.

<https://github.com/hpi-swa-lab/home-desktop-system/>

Sandblocks

A block-based programming environment designed for use by professional programmers. It is designed to support programmers in creating domain-specific tools for code and data that tightly integrate with a program's abstract syntax tree.

<https://github.com/hpi-swa/sandblocks/>

Animations

An extension for Squeak/Smalltalk that employs a simple programming model for adding animations to the Morphic framework.

<https://github.com/hpi-swa/animations>

Widgets

A set of graphical controls such as tree views, lists views, and buttons implemented in Squeak/Smalltalk using the Signals observer pattern.

<https://github.com/hpi-swa/widgets>

GlyphHub

Creating fonts is a complex task that requires expert knowledge in a variety of domains. GlyphHub is a platform that aims to enhance the means of communication by integrating complex font rendering and editing in a live environment, including an approach to generate code based on users' live edits.

<https://github.com/hpi-swa-lab/GlyphHub>

SandBlocks - Blocks to the Rescue

An approach to combine both textual and visual elements in a shared programming system. Developers can rely on the familiar textual representation of source code but also leverage the programming experience with a visual language as needed.

<https://github.com/hpi-swa-lab/SandBlocks-BlocksToTheRescue>

smalltalkCI

A framework for testing Smalltalk projects written in Squeak/Smalltalk, GemStone, and Pharo on Linux, macOS, and Windows. It provides support for Smalltalk on Travis CI and can be used with GitHub Actions, GitLab CI, AppVeyor, and other CI infrastructures.

<https://github.com/hpi-swa/smalltalkCI>

<https://docs.travis-ci.com/user/languages/smalltalk>

RSqueak/VM

A Squeak/Smalltalk virtual machine written in the language implementation framework RPython that allows for various research experiments such as performance optimizations and language compositions.

<https://github.com/hpi-swa/RSqueak>

Babelsberg

A formal design of Object-Constraint Programming with multiple implementations for object-constraint programming to integrate constraint declaration and continuous satisfaction with mutable object-oriented structures and behavior.

<https://github.com/babelsberg>

Theseus

Adaptive just-in-time data structure optimization with compound values. Prototype and applications to Racket and Smalltalk.

<https://github.com/shiplift/theseus>

<https://github.com/shiplift/PycketOnAShip>

<https://github.com/shiplift/RSqueakOnABoat>

ContextJS

Context-oriented programming provides dedicated support for defining and composing variations to a basic program behavior. ContextJS implements context-oriented programming for JavaScript and introduces language abstractions to define a variety of scopes to dynamically adapt behavior variations at runtime.

<https://github.com/LivelyKernel/ContextJS>

<https://www.npmjs.com/package/contextjs>

SqueakJS

Executes Squeak in a web page without a plugin. It is a fully capable virtual machine implemented in pure JavaScript running unmodified Squeak images. Squeak is a modern implementation of Smalltalk, the original dynamic object-oriented programming environment. It runs bit-identically on virtually any platform, and now in the web browser, too.

<https://github.com/bertfreudenberg/SqueakJS>

<https://squeak.js.org>

Lively Web

A browser-based runtime and development environment with live capabilities allowing to inspect and change applications and the system while it is running. Developers share applications and tools they created in Lively Web through an instance-based publication mechanism.

<https://lively-web.org/welcome.html>

<https://github.com/LivelyKernel/LivelyKernel>

Matriona

An experimental module system for Squeak/Smalltalk based on nested classes and inspired by Newspeak.

<https://github.com/hpi-swa/smalltalk-nested-classes>

SwaLint

An extendable code critics tool for Squeak/Smalltalk projects. Using object-oriented code metrics, SwaLint can give developers insight on the structure of their code and the architecture of their software. Codifying best-practices for Smalltalk programs, SwaLint is a hands-on tool to improve code quality.

<https://github.com/hpi-swa-teaching/SwaLint>

Community Code Project

A code review tool supporting ongoing collaborative discussions on code quality of a variety of meta objects such as packages, classes, protocols, and methods in the Squeak/Smalltalk environment.

<https://github.com/hpi-swa-lab/CommunityCodeReview>

Beiträge zu Projekten*Squeak/Smalltalk*

An object-oriented, class-based, reflective, and self-sustaining programming system and a dialect of Smalltalk with support for live and exploratory programming.

<https://squeak.org>

OpenSmalltalk VM

The cross-platform virtual machine for Squeak, Cuis, Newspeak, and Pharo.

<https://github.com/OpenSmalltalk/opensmalltalk-vm>

SqueakSSL Plugin

A plugin for the OpenSmalltalkVM that provides an interface to the native SSL/TLS facilities with support for Windows, Unix, and MacOS.

<https://github.com/squeak-smalltalk/squeakssl>

SqueakCI

The base environment for running Squeak/Smalltalk continuous integration tests.
<https://github.com/squeak-smalltalk/squeak-ci>

Ohm

A library and language for building parsers, interpreters, compilers, and more.
<https://github.com/harc/ohm>

GraalVM

A high-performance, polyglot virtual machine.
<https://github.com/oracle/graal>

Truffle

A framework for implementing languages and instruments on top of the GraalVM.
<https://github.com/oracle/graal/tree/master/truffle>

Travis Build

A library used on Travis CI workers to generate build scripts. The library can be extended to provide community-supported languages such as Dart, R, and Smalltalk.
<https://github.com/travis-ci/travis-build>

PyPy

An alternative implementation of the Python programming language. It includes RPython, a translation and support framework for producing implementations of dynamic languages, emphasizing a clean separation between language specification and implementation aspects.
<http://pypy.org>

Topaz

A high-performance implementation of the Ruby programming language written in RPython.
<https://github.com/topazproject/topaz>

13 Drittmittelprojekte

Deutsche Forschungsgemeinschaft (DFG), Sachbeihilfe (2021–2023)

LIVE: Empirical Studies on the Effects of Liveness on Programming

With our project, we want to forward liveness in development environments to improve program comprehension and with that to help programmers write better code. In the recent past, several research communities introduced the ideas of liveness as “an impression of changing a program while it is running” to an increasing number of domains. Various live programming tools and environments have been created and a number of commercial programming systems, such as Microsoft Excel and Jupyter Notebooks, support liveness to different degrees. While designers of programming environments assume liveness to improve domain exploration and program comprehension, the empirical backing for these claims so far is insufficient and inconclusive. This lack of experimental evidence might not only lead to liveness being promoted in settings in which it is not beneficial, but also in settings in which it yields detrimental effects. In our project, we will determine the effects of liveness on programming. By conducting a family of controlled experiments, we will investigate liveness with respect to task complexity, programmer experience, feedback cycles, and tool support. In a longitudinal study, we will inquire into ways programmers adopt live programming tools and workflows. The insights from this project and derived recommendations will support designers of future programming environments deciding when, where, and how to support liveness.

HPI-Stanford Design Thinking Research Program, 12th–14th Call (2019–2022)

Software Design in an Exploratory Culture I, II, and III: Toward a Pattern Language to Discover, Learn, and Communicate Exploratory Programming Practices

Understanding unfolds only gradually. Software developers thus strive for simple and malleable design models and code elements to react to insights and changes swiftly and concisely. While Design Thinking and agile development provide guidance mainly for user-centered and collaborative activities, complementary processes and supporting technologies suitable for exploring complex problem domains and solution spaces have been neglected. With programming-as-theory-building at the core of software development, we apply the idea of pattern languages to capture original and modern exploratory programming practices. Based on the concise representation of each pattern, such a pattern language for exploratory programming

can support developers discover, learn, and communicate best practices to arrive at and maintain a high-quality code base. We argue that software development will greatly benefit from such a synergy of insights from the Design Thinking and Design Patterns communities to provide means to explore interesting problem domains and propose meaningful software solutions more creatively and effectively.

Oracle Labs (2021)

Advancing the Polyglot Programming Experience

Providing support for polyglot applications is a key part of the GraalVM ecosystem. Being able to use more than one language for building applications gives developers a much broader choice of tools and reusable software artifacts. However, the technology enabling this new style of programming can benefit from the design and evaluation of novel APIs, tools, and architectural approaches. In this project, we work on a coherent programming experience for polyglot programming. We advance and evaluate polyglot programming with GraalVM in a series of tasks and exercises. We build polyglot prototypes and applications that explore the capabilities of GraalVM for different use cases. Based on the lessons learned, we work on concepts, tools, and APIs for an improved programming experience on a polyglot VM.

14 Mitarbeit in Programmkomitees

Conference on Object-oriented Programming, Systems, Languages, and Applications (OOPSLA) 2021

2021-10-17..22

Co-located with SPLASH 2021

Chicago, Illinois, USA (virtuell)

<https://2021.splashcon.org/track/splash-2021-oopsla/>

Onward! Essays 2021

2021-10-17..22

Co-located with SPLASH 2021

Chicago, Illinois, USA (virtuell)

<https://2021.splashcon.org/track/splash-2021-Onward-Essays/>

Onward! Papers 2021

2021-10-17..22

Co-located with SPLASH 2021

Chicago, Illinois, USA (virtuell)

<https://2021.splashcon.org/track/splash-2021-Onward-papers/>

IEEE International Symposium on Visual Languages and Human Centric Computing (VL/HCC) 2021

2021-10-10..13

St. Louis, Missouri, USA (virtuell)

<https://conf.researchr.org/home/vlhcc-2021/>

Virtual Workshop on Context-oriented Programming (COP) 2021

2021-07-12

Co-located with ECOOP 2021

Aarhus, Denmark (virtuell)

<https://2021.ecoop.org/home/COP-2021/>

Mining Software Repositories Conference (MSR) 2021

2021-05-17..19

Co-located with ICSE 2021

Madrid, Spain (virtuell)

<https://2021.msrrconf.org/>

The First International Conference on Code Quality (ICCQ) 2021

2021-03-27

Moscow, Russia (virtuell)

<https://www.iccq.ru/>

Programming Experience Workshop (PX/21) 2021

2021-03-23

Co-located with ‹Programming› 2021

Cambridge, UK (virtuell)

<http://programming-experience.org/px21/>

<https://2021.programming-conference.org/home/px-2021>

International Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs)

2021

2021-03-23

Co-located with ‹Programming› 2021

Cambridge, UK (virtuell)

<https://2021.programming-conference.org/home/MoreVMs-2021>

15 Begutachtungen und Gremientätigkeiten

Begutachtungen

Robert Hirschfeld

Association Internationale pour les Technologies Objets (AITO)

Deutsche Forschungsgesellschaft (DFG)

Deutscher Akademischer Austauschdienst (DAAD)

Deutsch-Amerikanische Fulbright- Kommission

Konrad-Adenauer-Stiftung (KAS)

Studienstiftung des deutschen Volkes

Gutachten zu Bachelorarbeiten, Masterarbeiten und Dissertationen

Gremientätigkeiten

Robert Hirschfeld

Steering Committee Past-Chair, ACM SIGPLAN Onward!

Steering Committee Outgoing Past-Chair, AOSA

Steering Committee Member, ACM SIGPLAN Dynamic Languages Symposium (DLS)

Advisory Board Member, AOSA Programming Journal

Associate Editor, AOSA Programming Journal

Managing Editor, AOSA Programming Journal

Organizing Committee Member, Workshop on Context-oriented Programming (COP)

Organizing Committee Member, Programming Experience Workshop (PX)

Mitglied, Fakultätsrat der Digital-Engineering-Fakultät

Mitglied, Promotionsausschuss der Digital-Engineering-Fakultät

Sprecher, HPI-Forschungskolleg

Vorsitzender, Berufungskommission Digital Energy – Infrastructure

Vorsitzender, Berufungskommission Digital Energy – Ubiquity

Stellv. Vorsitzender, Berufungskommission Internet Technology and Systems

Stellv. Vorsitzender, Berufungskommission Internet Security

15 *Begutachtungen und Gremientätigkeiten*

Jens Lincke

Mitglied, Berufungskommission Digital Energy – Infrastructure

Mitglied, Berufungskommission Digital Energy – Ubiquity

Stellv. Mitglied, Fakultätsrat der Digital-Engineering-Fakultät

Fabio Niephaus

Project Advisory Board Member, GraalVM

Tobias Pape

Managing Editor, AOSA Programming Journal

Steering Committee Member, Future SOC Lab

Patrick Rein

Secretary, AOSA

Treasurer, AOSA

Mitglied, Fakultätsrat der Digital-Engineering-Fakultät

Marcel Taeumel

Member, Squeak Oversight Board

1. Vorsitzender, Squeak Deutschland e.V.

16 Tagungsorganisation

Jahresversammlung des Squeak Deutschland e.V.

2021-12-04

Hasso-Plattner-Institut, Potsdam, Germany (virtuell)

https://squeak.de/news/2021/10/19/squeak_treffen/

(Marcel Taeumel, Robert Hirschfeld)

Virtual Workshop on Context-oriented Programming (COP) 2021

2021-07-12 or 2021-07-13

Co-located with ECOOP 2021

Aarhus, Denmark (virtuell)

<https://2021.ecoop.org/home/COP-2021/>

(Harumi Watanabe, Robert Hirschfeld)

Virtual Conference on the Art, Science, and Engineering of Programming

(*Programming*) 2021

2021-03-22..26

Cambridge, UK (virtuell)

<http://2021.programming-conference.org/>

(Patrick Rein, Fabio Niephaus, Tom Beckmann, Tobias Pape, Toni Mattis)

Programming Experience Workshop (PX/21) 2021

2021-03-23

Co-located with *Programming* 2021

Cambridge, UK (virtuell)

<http://programming-experience.org/px21/>

<https://2021.programming-conference.org/home/px-2021>

(Robert Hirschfeld, Richard P. Gabriel)

International Workshop on Modern Language Runtimes, Ecosystems, and VMs

(*MoreVMs*) 2021

2021-03-23

Co-located with *Programming* 2021

Cambridge, UK (virtuell)

<https://2021.programming-conference.org/home/MoreVMs-2021>

(Fabio Niephaus)

17 Herausgeberschaft

Zeitschriften

Journal on The Art, Science, and Engineering of Programming

Tobias Pape und Robert Hirschfeld

<https://programming-journal.org/2020>

Tagungsbände

Proceedings of the *Workshop on Context-oriented Programming (COP) 2021*. Co-located with the European Conference on Object-oriented Programming (ECOOP), Aarhus, Denmark, July 12, 2021, ACM DL.

Yu David Liu, Harumi Watanabe, Robert Hirschfeld, Atsushi Igarashi, and Hidehiko Masuhara (eds.)

Proceedings of the *Programming Experience 2021 (PX/20) Workshop*. Co-located with the International Conference on the Art, Science, and Engineering of Programming (⟨Programming⟩), Cambridge, UK, March 23, 2021, ACM DL.

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

Web-Portale

Fachgebiet Software-Architekturen

<https://www.hpi.de/swa>

Programmiersprachen, -werkzeuge und -umgebungen

<https://squeak.org>

<https://squeak.de>

<https://squeak-ev.de>

<https://lively-kernel.org>

Zeitschriften

<https://programming-journal.org>

Konferenzen

<https://programming-conference.org>

<https://modularity.info>

<http://programming-experience.org>

<https://dynamic-languages-symposium.org>
<https://onward-conference.org>

Forschungsverbände

<https://aosa-inc.org>

Software-Repositoryen

<https://github.com/orgs/hpi-swa>

<https://github.com/orgs/hpi-swa-lab>

<https://github.com/orgs/hpi-swa-teaching>

<https://www.hpi.uni-potsdam.de/hirschfeld/squeaksource>

18 Mitgliedschaften

Robert Hirschfeld
ACM, AITO, AOSA, Squeak Deutschland e.V.

Jens Lincke
ACM, Squeak Deutschland e.V.

Toni Mattis
ACM

Fabio Niephaus
ACM, Squeak Deutschland e.V., CdE e.V.

Tobias Pape
AOSA, Squeak Deutschland e.V.

Patrick Rein
ACM, AOSA, Squeak Deutschland e.V.

Marcel Taeumel
Squeak Deutschland e.V.

19 Auszeichnungen

Preise

Mauricio Verano Merino, Tom Beckmann, Tijs van der Storm, Robert Hirschfeld, and Jurgen Vinju. *Getting Grammars into Shape for Block-based Editors*. In Proceedings of the ACM Conference on Software Language Engineering (SLE) 2021, co-located with the Conference on Object-oriented Programming, Systems, Languages, and Applications (OOPSLA), Chicago, Illinois, USA, October 17-19, 2021, ACM DL. *ACM SIGPLAN SLE 2021 Distinguished Artifact Award*

Tobias Pape

AOSA Outstanding Service Award 2021

Patrick Rein

AOSA Outstanding Service Award 2021

Masterabschlüsse mit Auszeichnung

Christian Flach

Call Graphs für Live Programming: Call Tracing implementiert in Babylonian/S basierend auf einem Überblick von Techniken zur Datenextraktion für Dynamische Analyse.

20 Sonstiges

Existenzgründungen aus der Wissenschaft (EXIST)

ChartCrafter

Projektlaufzeit: April 2022 bis März 2023

Projektteam: Klara Seitz

Mentor: Robert Hirschfeld

ChartCrafter ist ein Editor inkl. Plattform, mit dem selbstentworfenen Häkelmuster bzw. Anleitungen standardisiert designed, das Layout berechnet und anschließend veranschaulicht werden sollen (Muster der einzelnen Symbole in Häkelschrift, 2D-Version und 3D-Version). Die Web-Applikation ist im Rahmen einer Masterarbeit entstanden und spricht sowohl die Gruppe der Do-It-Yourself-Bewegung als auch professionelle Designerinnen und Designer an. Umsatz soll über kostenpflichtige Zusatzfunktionen einer Freebie-Version generiert werden.

Typeshift

Projektlaufzeit: Januar 2020 bis März 2021

Projektteam: Doreen Stahr, Robin Schreiber

Mentor: Robert Hirschfeld

Im Fokus des Vorhabens steht das Angebot einer Software namens Typeshift, mit der interaktive Marketinginhalte wie Spiele, Grafiken, Quizes und Ähnliches erstellt werden können, ohne dass Programmierkenntnisse benötigt werden. Typeshift basiert auf der objektbasierten Entwicklungsumgebung Lively Kernel, die als Open Source im Internet zugänglich ist. Es ist geplant, die an sich bereits innovative Software weiterzuentwickeln und diese um ein Erweiterungsmodul zur Echtzeitkollaboration zu ergänzen. Neben dieser Produktinnovation ist geplant, eine Parts-Bibliothek zur Verfügung zu stellen, in der Nutzer ihre selbsterstellten Bausteine anderen Nutzern gegen Gebühr anbieten können. Die Software soll als Software-as-a-Service-Lösung (SaaS) zunächst in der DACH-Region angeboten werden.

