Web-based Development Environments
Organization and Topics

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Software Architecture Group
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http://www.hpi.uni-potsdam.de/swa/

2017/2018

DEMO

TOPICS

Topics WebDev

1. Handwriting Recognition
2. Semantic Source Code Navigation
3. Lively4 App
4. VivideJS
5. Scripting Cloud Data Flow
6. Continuous Time Computation
7. Offline First
8. Persistent Annotation of any Web-sites
9. Particle-based Simulations
10. Exploring Microdata
11. PDF Annotator

Project: **Handwriting Recognition**

- Problem:
  - no free handwriting recognition usable in the browser
- Idea:
  - new handwriting service
  - or translated library using emscripten
- Failed Attempts:
  - Single Character Recognition
  - Tesseract (excels at printed text)
  - Microsoft Windows Handwriting (not free and accessible)
  - Paid Service (see MyScript)

Project: **Semantic Source Code Navigation**

- Problem:
  - Source code in files and its history is hard to navigate
- Idea:
  - Generate domain specific events (method/class in module changed)
  - Build/use database data base of class/method/history for navigation/...
- Application:
  - Method history: git file history -> class/method changed history
  - Senders/implementors (e.g. shift-click navigation)
- Related Work:
  - Tern
  - Smalltalk

Project: **Lively4 App**

- Problem:
  - Lively4 as a Web-app is only usable online (server + client)
  - Challenge: Fixed version vs. still useable to develop
- Idea:
  - Package server and client into one application
  - Offline only + sync (app/server combo)
- Application:
  - Archiving a demo
- Implementation:
  - Electron App

Project: **VivideJS**

- Problem:
  - Dataflow-fueled tool building
- Idea:
  - Use data-flow define domain-specific queries
  - Combine this with generic, but customizable visualizations
  - -> Interactive construction of a domain specific visualization
- Application:
  - Combine interactive data-base queries with immediate visualization
- Related Work:
  - Vivide: https://github.com/hpi-swa/vivide
  - Flower: Otto et al. *Exploratory Authoring of Interactive Content in a Live Environment,* 2016

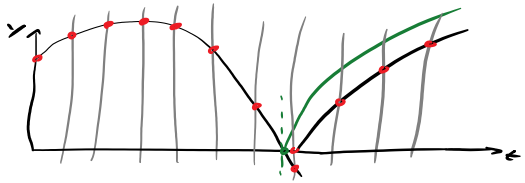
Project: **Scripting Cloud Data Flow**

- Problem:
  - Automate tedious workflow

```
(1) When a new '.pdf' file is in my dropbox folder 'PhD/papers'
(2) Search for its '.bibtex' data on google scholar
(3) Append that data to 'references.bib' in the dropbox folder
(4) And rename the file to '%author_%year_%title'
```

  - But End-development tools are often to rigid
- Idea:
  - Instead of using fixed recipes/configurable services, provide more fine-grained and scriptable data flow
- Related Work:
  - IfThisThanThat
  - Yahoo! Pipes
  - Apple Automator

Project: **Continuous Time Computation**



- Problem:
  - Physically correct bouncing ball
  - State of the art: move ball above the ground (repairing)
  - Alternative: Check for interesting times and adjust time resolution for more fine grained simulation
- Idea:
  - Interval analysis to find interesting points in time
  - Describe time-varying variables: ṡ = v * t
- Related Work:
  - Alan Borning. *Wallingford: Toward a Constraint Reactive Programming Language,* 2016
  - Simplex3: *http://www.simplex3.net/Body/ModelLanguage/German/indexDynamicAbstract.html*

Project: **Offline First**

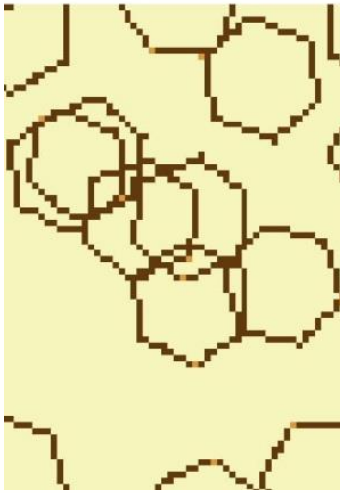
- Problem:
  - Browsers cache only consumption, but not creation of content
- Idea:
  - Service worker can act as intelligent read/write cache
  - Challenging: conflicts and merging
- Implementation:
  - Cache and control GET/PUT/OPTION requests
  - Cloud storages and services can provide you with metadata about recent changes
  - Meta information can invalidate caches, e.g. Dropbox hashes, GitHub version numbers

Project: **Persistent Annotation of any Web-sites**

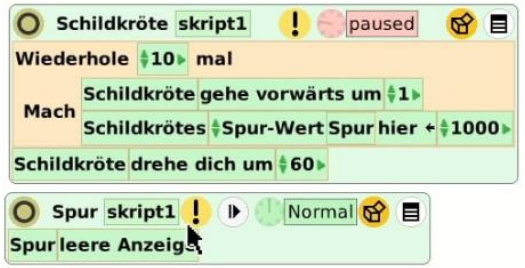
- Problem:
  - Lively4 loadable on every website through Chrome extension
  - But: only direct additions on web pages are persisted
  - Interactive modification of DOM through Halo is not persistent
- Idea:
  - Persistent Annotations in all web sites
  - Capturing Edits
  - Identify object through patterns (Lively4 by Example)
- Related Work:
  - GreaseMonkey
  - https://web.hypothes.is/
- Goal:
  - Capture deletes/rearranges/styling/addition of content with Halo
  - Replay changes on future visits

Project: **Particle-based Simulations**

- Problem
  - Domain-specific tile scripting of particle simulations
  - Active Essays based on complex scenarios
    - e.g. Epidemics, Forest fire, Hunter prey
- Idea:
  - Single Instruction Multiple Data
  - Extreme: Shader programming for kids
- Implementation:
  - High performance: WebGL
- Related Work
  - Scratch (Snap), Blockly
  - Kedama
  - Squeak Etoys 6.0 course on Open HPI
  - Shadama: http://tinlizzie.org/~ohshima/shadama2/live2017/



'Schildkröte'



Project: **Exploring Microdata**

- Problem:
  - Websites provide semantic information about displayed content
- Idea:
  - Reify semantic information and make them programmable
- Application:
  - Personal interactive ScrapMap for vacation using tripadvisor, wikipedia, eventim
- Goal:
  - Extract RDFa Data, Microformats
  - Embed UI for Publish/Share
- Related Work:
  - https://developers.google.com/structured-data/testing-tool/

Project: **PDF Annotator**

- Problem:
  - Read and annotate pdfs in the browser
- Idea:
  - use PDF.js for reading pdfs and extracting annotations
  - use additional annotation library
- Related Work:
  - https://via.hypothes.is/

Development Links

- Github Projects:
  - https://github.com/livelykernel/lively4-core
  - https://github.com/LivelyKernel/lively4-server (optional)
  - https://github.com/LivelyKernel/lively4-chrome-loader (optional)
- Deployed on lively-kernel.org:
  - https://lively-kernel.org/lively4/lively4-core/start.html

Getting Started

Basic Lively4 development workflow:

a) Go to https://lively-kernel.org/lively4/lively4-core/start.html

b) Play around with objects and in workspace
   - Ctrl-Left/Right Click for Halo and context menu
   - Content is locally persisted

c) Use tools to browse and change modules and templates

d) Open Sync tool and log with github account

e) Press sync to update your instance and commit changes

Getting Started

Advanced Lively4:

- Work in different branches under https://lively-kernel.org/lively4
- Install your own lively4-server

DELIVERABLES/PROJECT

Organization

- Course
  - Weekly meetings (Slot to be found)
  - Project-Seminar, 4 SWS, 2 students per group
- Grading
  - 6 ECTS graded credit points
  - Grade based on project work and presentation
- Hand-In
  - Presentation, Screencast, Sourcecode
- Important dates
  - Project topics on October 17th
  - Enrollment with preferred topic names on or before October 23th
    - Mail to **stefan.ramson@hpi.de** and **jens.lincke@hpi.de** with WebDev17/18 in subject
  - Topic assignment on October 24th
  - Presentation dates determined after topics are assigned

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