A whiteboard for Saros

To develop a whiteboard functionality for distributed pair programming, iterative by prototypes

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Overview

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IV. Drawing in Java and Eclipse
V. Requirements for a distributed whiteboard
VI. Test-driven development
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Goals

- Experiences with prototyping
- Develop a working whiteboard
  - Determine its requirements
    - By end user feedback
    - Compare and synchronize with scientific literature
- If possible complete unit tests
  - How does test-driven development apply in this scope
Prototyping

- Creating of incomplete software (parts)
  - to allow users to evaluate proposals
  - to show developers the needs
    - Maybe only by GUIs
      - Keyword UX-Design (User-experience Design)
      - Proprietary programmes like iRise, Axure, VisualPrototyper …
    - Literature: The Mythical Man-Month: Essays on Software Engineering, Fred Brooks

- Iteratively extending them by user feedback
Prototyping

- Very up to date
  - some argue it should be used all the time
  - very effective for on-line systems, especially transaction processing

- Most beneficial for programmes having a lot of human-computer interactions
  - fits for developing a whiteboard
Prototyping steps
source: English wikipedia

1. Identify basic requirement
   - desired in- and output

2. Develop Initial Prototype
   - if possible only user interface

3. Review
   - Customers examine prototype, feedback on additions and changes

4. Revise and Enhance the Prototype
   - improve specification and implementation
   - after changes, repeat step 3 and 4

To develop a whiteboard for DPP, iterative by prototypes
Prototyping – types (selection)

- **Throwaway prototyping**
  - developing of usually discarded snippets
    - quick feedback by users
    - user-testable interfaces

- **Evolutionary prototyping**
  - robust prototype in a structured manner
  - continuously refined
    - flexible, working basis until the final product

- **Explorative prototyping**
  - estimate of certain solutions
  - determine whether specifications and ideas are suitable
Prototyping – in the context of Saros

- The whiteboard depends on Saros
  - No Throwaway prototyping
- It is quite probable that only students will test
  - we may not get a balanced feedback

- An evolutionary and explorative approach
  - to estimate some pre-defined possible requirements for a DPP whiteboard
  - to find new “real” ones by testing students
Prototyping – in the context of Saros

- It is quite probable that only students will test

  to boost the amount and diversity of testing participant we might decouple Saros from Eclipse (optional)
  - distribute it as RCP or standalone Jabber client

  Advantage: A lot of testers for Saros session, network, chat and whiteboard

  Disadvantage: Most prototype users won't be programmers
Get possible DPP whiteboard requirements

Overview

- existing whiteboards and their features
- why does DPP need a whiteboard
- and why might someone not be very likely to use one (like me)
  - which features would help
- a dream DPP whiteboard
State of the art
Existing distributed whiteboards

There are thousands
sTeam, Adobe Connect Pro, MBONE, Inkscape, XPairtise, Drawboard, Groupboard, Edraw Mind Map ...

To develop a whiteboard for DPP, iterative by prototypes
What do they offer?

- pencil: always
- usually standard shapes like line, rectangle and circle
- others
  - selection (Adobe Connect Pro, sTeam, Inkscape)
  - text
  - half transparent text marker (Adobe)
  - Mind Maps (Edraw Mind Map and others)
  - connectors (Inkscape)
  - desktop-like drawable home area (sTeam)
  - Screen shots, export (i.e. to JPEG or SVG)
Existing distributed whiteboards

Problem: why not use an existing one?
- apart of Saros-integration

Better question: what advantages has a whiteboard specialized on distributed programming?
Why does DPP need a whiteboard?

- Giving overviews graphically
- Explaining abstract ideas
- Informality

"What designers need are computerized tools that allow them to sketch rough design ideas quickly“

- Abstract and formal methods do not always fit to improve communication
  - may make it difficult to communicate with end users
- ideas are faster to sketch than to specify formally
Why might a programmer not like to use a whiteboard?

- Difficult to draw a pencil with the mouse
  - Most users do not have a pen pad
- It may be clumsy to modify, extend or scale
- It may take to long to draw what you want to express
  - Classes, inheritance, concurrency drawn by pencil and rectangles
- The drawn sketches may not be used again
  - Hardly for documentation: good looking sketches are time intensive
  - Not for code generation (related work, see [traetteberg, 2002])
  - the area is quickly used off
To develop a whiteboard for DPP, iterative by prototypes

Basic requirements – whiteboard for programming

- Standard tools and shapes
  - It may be clumsy to modify and extend
    - selecting, modifying and removing of element
  - The drawn sketches may not be used again
    - Save and reload

- (requirements to be verified by the explorative prototyping)
Basic requirements – whiteboard for programming

- Difficult to draw a pencil with the mouse and it may take too long to draw
- Connectors and templates for commonly used UML-like shapes (optional)
- The area is quickly used of
- Various pages, zooming (optional)

(Requirements to be verified by the explorative prototyping)
Dream whiteboard

A dream DPP whiteboard for me would be able to:

- recognize patterns (like E-Chalk)
- have a possibility to introduce semantic, i.e. Domain Specific Language
- enable layouting
- be able to generate elements by drag and drop (i.e. UML-like class shapes from package explorer)
- be personalisable and extendible
- ...

More an UML and Model-Drive-Architecture helper, however, it leads us to GEF and GMF
Drawing (and modelling) in Java and Eclipse

Overview

- GEF and GMF
- Pixel based
- SVG (batik, SVG Salamander)
Graphical Editing Framework

- helper Framework to edit models graphically
- based on Draw2d
  - SWT based Java2D compliant
- offers infrastructure to deal with shapes (figures)
  - strict MVC infrastructure
  - layouts and coordinate system
  - edit policies and commands

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Graphical Modelling Framework

- based on GEF and EMFs Ecore (Eclipse Modeling Framework)
- may automatically generate graphical editors and DSLs by XML-mappings
- has in my experience a too specialized scope
GEF and GMF

- Both focus more on formal model editing
- To improve developing they require quite a big scope of usage (a real graphical editor)
  - and quite some knowledge
- No option for Saros' whiteboard
  - especially as it should improve communication by informal sketches
Pixel based

- Like XPairtise's whiteboard or the SWT paint example

- Disadvantages:
  - No selection, moving, modifying of elements
  - difficult to synchronize
    - sending of whole repaint regions?
    - sync. execution on the server (might have a heavy delay)
Scalable Vector Graphics

- open XML standard for 2D vector graphics
  - under w3c development since 1999
- supports
  - vector- and raster graphics as well as text
  - grouping, styling, modifying and composing of elements
  - animations, JavaScript and CSS
- renderable and dynamical modifyable in Java by
  - Batik
  - SVG Salamander
- extendible (i.e. introducing new tags, namespaces etc.)
Best SVG 1.1 implementation after Opera

- generate XML by drawing
  - maybe not used in our case
- display an XML
- handle selection by SVG listeners
- Swing based
  - need to use an embedded Frame for eclipse

- after writing some test snippets it works fine for me within eclipse
Requirements 2

What requirements may be given by distributed drawing?

- same picture for every peer
- fast drawing
- informing if any other user is drawing
- blocking of elements that are in modification (i.e. text edit)
  (not complete yet)
Requirements 2 – distributed whiteboard

- usage of SVG would be an advantage
  - text-based
    - smaller amount of transferred data
    - easier to synchronize
  - standard conform ...
    - there are several SVG + XMPP approaches to study about in this thesis, however, not yet standardised
      - could we make our whiteboard compatible with TransVerse? (XMPP+SVG whiteboard, initiators of proposal above)
Test-driven development

1) A test case is written
   - to define desired improvement

2) Run all tests and the new one will fail
   - if not, the feature is already implemented or the test case is wrong!

Note: I do not distinguish to test-first approach as only recently they may be seen as different approaches. Test-first is said to be more likely part of extreme programming
Test-driven Development

3) Write the code to make the test work
   ▶️ don't write more than necessary
     ➥ would result in lack of test cases

4) Rerun the tests
   ▶️ should pass now

5) Refactor the code

… and repeat all steps
Test-driven development

- Not (yet) interesting for this work in the beginning
  - Not very suitable for user interfaces
    - because full success or failure is required
    - a lot of non testable functionalities (i.e. flicker)
      - Note: Writing snippets, I spend almost all my time on this
  - or when depending on external libraries
    - a lot of mock objects are needed
  - or when working distributed
- In this cases it might be an interesting study for experienced test-driven developers
Test-driven development

- ... continued
  - Not very suitable as Saros is not implemented test-driven
    - test coverage gaps lead to false confidence
    - the test cases won't help to localise problems there
  - fits better for programming in groups or pairs (best agile programming)
- However, in the latter state of this work when receiving iteratively new requirements it might be interesting to apply TDD on a new (separated) part of the whiteboard
  - how test-driven development does apply in the conditions mentioned above (optional)
To develop a whiteboard for DPP, iterative by prototypes

Concept and timetable (abstract)

- March
  - 1st three weeks
    - extending snippet to first prototype
      - Tools (pencil and common shapes) and Toolbar
      - Saros integration
    - reading about SVG+XMPP
  - 4th and 5th week
    - consolidate class structure
    - writing test cases and bug search
    - How to find test users
      - find appropriate lectures for Saros exercises; ask professors/tutors
      - ask for volunteers using studi-replies@math.fu-berlin.de
To develop a whiteboard for DPP, iterative by prototypes

Concept and timetable

- April
  - 1st week
    - if necessary, finishing left over work
    - creating questionnaires and exercises
  - rest of April
    - with semester start some students should be using Saros
      - helping installing and using Saros
      - getting feedback and evaluate questionnaires
    - searching and comparing literature
    - further planning, maybe TDD
To develop a whiteboard for DPP, iterative by prototypes

**Concept and timetable**

- **Mai**
  - continue iterative prototyping and refining
  - if there is time to implement and evaluate optional requirements
  - extract a standalone Saros version (optional)
    - or at least finding out necessary steps
  - reading, reading, reading

- **June**
  - start writing thesis

Note: tight calculation, but there is a month left at the end
Questions and comments
Viele Dank!
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Sources

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