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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I. Goals
II. Prototyping
III. Possible whiteboard requirements
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V. Requirements for a distributed whiteboard
VI. Test-driven development
VII. Concept and timetable (abstract)

Goals

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

Prototyping

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- 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

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- 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*

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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

Prototyping – types (selection)

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- 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

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- 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

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- 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

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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

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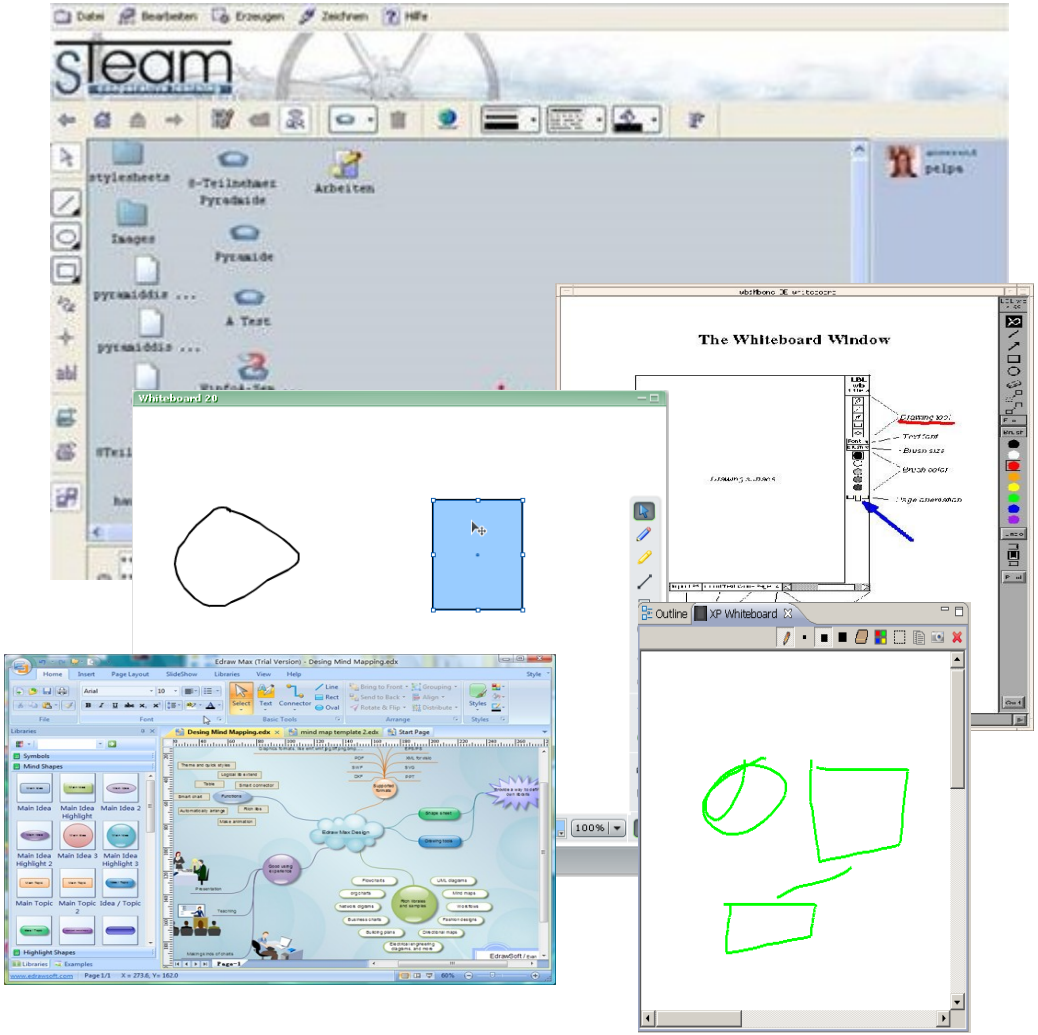
- There are thousands

  sTeam, Adobe Connect Pro, MBONE, Inkscape, XPairtise, Drawboard, Groupboard, Edraw Mind Map …



What do they offer?

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- 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

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- Problem: why not use an existing on?
  - apart of Saros-integration
- Better question: what advantages has a whiteboard specialized on distributed programming?

Why does DPP need a whiteboard?

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- Giving overviews graphically
- Explaining abstract ideas
- Informality
  - *”What designers need are computerized tools that allow them to sketch rough design ideas quickly“*
    Landay, J.A., Myers, B.A. Interactive Sketching for the Early Stages of User Interface Design (1995)
    - 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 ?

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- 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

Basic requirements – whiteboard for programming

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- 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

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- Difficult to draw a pencil with the mouse and It may take to 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

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- 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

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Overview

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

Graphical Editing Framework

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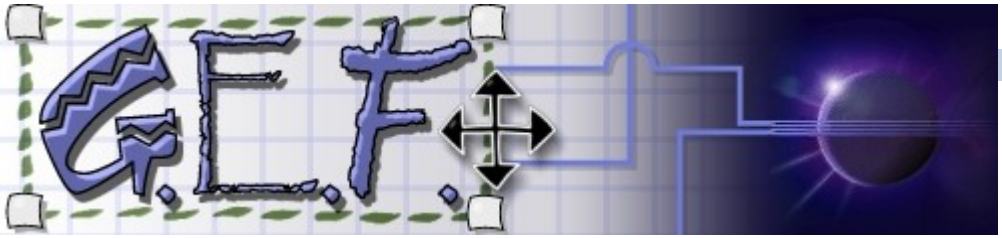

- helper Framework to edit models graphically
- based on Draw2d
  - SWT based Java2D compliant
- offers infrastructure to deal with shapes (figures)
  - strict MVC infrastructure
  - layouts and coordinate system
  - edit policies and commands

Graphical Modelling Framework

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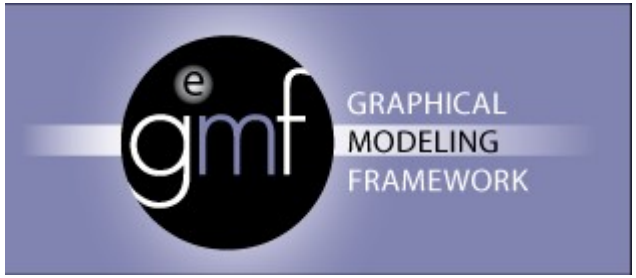
- based on GEF and EMFs Ecore (Eclipse Modeling Framework)
- may automatically generate graphical editors and DSLs by XML-mappings



- has in my experience a too specialized scope

GEF and GMF

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- 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

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- 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

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- open XML standard for 2D vector graphics
  - under w3c development since 1999
- supports
  - vector- and raster graphics as well as text
  - gouping, 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

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- 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

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- 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
      - http://xmpp.org/extensions/inbox/whiteboard2.html
      - could we make our whiteboard compatible with TransVerse? (XMPP+SVG whiteboard, initiators of proposal above)

Test-driven development

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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

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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-diven development

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- 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-diven development

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- … 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)

Concept and timetable (abstract)

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- 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

Concept and timetable

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- April
  - 1st week
    - if necesary, 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

Concept and timetable

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- 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

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Viele Dank!

Sources

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english and german wikipedia
google search (especially for whiteboards and distributed whiteboards)
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