On the Use of Visualization to Support Awareness of Human Activities in Software Development: A Survey and a Framework

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Background

- **Key issue: awareness**

  An understanding of the activities of others, which provides a context for [one's] own activity

  - Who else is working on the project?
  - What they are doing?
  - Which artifacts they are or were manipulating?
  - How their work may impact other work?

- **Problem**

  To maintain awareness becomes particularly difficult in distributed collaborative work, face-to-face collaboration is not possible when the team is not collocated

Background (con't)

- **Related work**
  - Gutwin and Greenberg 2002
    - To mimic existing face-to-face awareness mechanisms
    - does not involve the manipulation of physical objects
    - To be unlikely to be in the distributed case

  - Feedthrough awareness [Dix 1994]
    - To get a sense of the ongoing activity in the workspace

  - Conguration management (CM) tools
    - To support concurrent development by multiple developers
    - To provide mechanisms to back out of unwanted changes
    - To provide a history and authorship of changes to the system

the Framework

- Purposes

  To describe visualizations of human activities

  - To guide tool designers as they develop a new tool as a formative evaluation tool

  - To be able to assess the value and application of a particular for potential tool users

  - To compare and understand the differences between various tools and identify potential new research areas for tool researchers

key dimensions of the Framework

- **Intent**

  To capture the general purpose and the motivation that lead to the design of the visualization

- **Information**

  To refer to the data sources that a tool uses to extract relevant awareness information

- **Presentation**

  To refer to how the tool or proposed tool presents the extracted and derived information

- **Interaction**

  To refer to the interactivity and liveness of the tools

- **Effectiveness**

  To capture the feasibility of the proposed approach, whether it has been and whether it has been deployed

Intent

- **Role**

  who will use the tools?

  - **Developers**

    Level (newcomer or not) ; type of team (co-located or not, small tight knit or large distribute)

  - **Maintainers, reverse engineers and reengineers**

    To explore activities in past and guide present and future tasks

  - **Managers**

    To gain an understanding of human activities in projects

  - **Testers and documenters**

    To find information about who has been developing which changes have been made in the projects

  - **Researchers**

    To investigate human activities and processes across the lifespan of multiple projects

Intent (con't)

- **Time**

  Whether the tools provides awareness of activities occurring in the present or in the past

- **Cognitive support**

  To capture how a tool or artifact can make human cognition easier or better

  Four categories of insight about human activities:
  - authorship
  - rationale
  - time
  - artifacts

Information

- **Change management**
  - configuration management and version control tools
  - Source information: the kept records of artifact changes and branch activities

- **Defect tracking**
  - tracking tools
  - Source information: defects and change requests

- **program code**
  - tools which provide general information such as awareness information regarding files, modules and components or detailed views of syntactic units.
  - source information: source code

Information (con't)

- **Documentation**
  - ❑ Source information: design and requirements

- **Information communication**
  - ❑ To help support awareness during collaboration and coordination tasks and further uncover the intent behind past human activities
  - ❑ Source information: email and instant messages

- **Derived data**
  - ❑ source information: data from multiple data sources

Presentation

- **Form**
  - ❑ A combination of text, hypertext and graphics

- **Kinds of views**
  - ❑ Annotations on existing views

  To emphasize the owner,state or history of a software artifact
  - ❑ Statistical views

  To provide comparison and analysis of human activity information
  - ❑ Graphic views

  To display relationships between human and software artifacts
  - ❑ Special view

  To provide cognitive support for particular information seeking or understanding tasks

- **Techniques**
  - ❑ visual variables

  (color and position) mapped to a human activity attributes.
  - ❑ Animation

Interaction

- **Batch/Live**
  - Offline tools displays the queried information using static graphs.
  - Online tool provide updated displays
- **Customization**
  - to suit particular user needs
- **Query mechanism**
  - special purpose languages to specify queries
  - specialized filter widgets, such as checkbox
  - directly interacting with the visualization, such as selection
- **View navigation**
  - To see specialized views

An overview for detailed views and a zoomable user interface
and hypertext

  - To compare two views side-by-side

Multiple views should be coupled

Effectiveness

- **Status**
  - Whether propose approaches have been completed
  - Availability, interoperability, scalability of tools

- **Cost**
  - Economic, installation and learning cost

- **Evaluation**
  - To be evaluated by designer (informal case studies)
  - To be evaluated by users
  - adopted

A survey of the tool, Seesoft

❑ Intent

To develop techniques for visual representation of large amounts of code for the purposes of code exploration and project management

❑ Information

- ■ data about authorship, age, and description of revisions provided by a version control system
- ■ Content of source files

❑ Presentation

line-based visualization that maps each line of source code into a thin row

The colour of each row represents a value of the attributes

A survey of the tool, Seesoft (con't)

❏ Interaction

To easily select a subset information with mouse and

techique "brushing" is
 employed

❏ Effectiveness
Seesoft's authors
report informal field
use in their organiza-
tion.

A survey of the tool, VRCS

- ❑ Intent

  to facilitate version control and module management

- ❑ Information
  - ■ Compilation file dependencies are extracted from make

- ❑ Presentation

  each version of the history is represented as a 3D tree showing module and file relationships in the x and y dimensions and time in the z-axis

- ❑ Interaction

  the most part the views are static, but the graphical representation of files and versions can be used for selecting which files to check in and out.
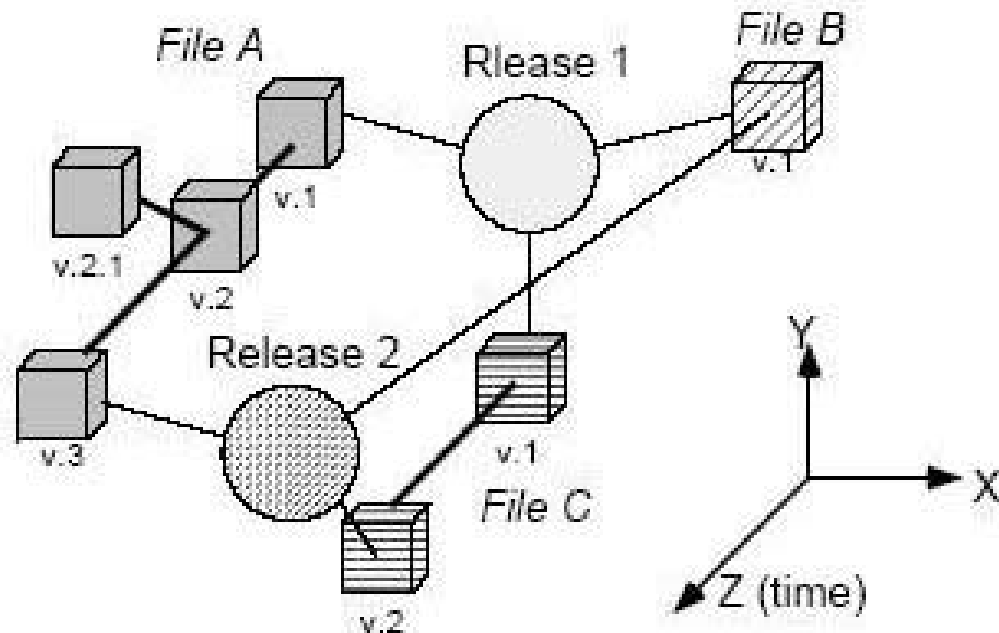
A survey of the tool, VRCS (con't)

❑ Effectiveness

To be evaluated with 10 graduate students.

To facilitate a faster check-in.

A survey of the tool, Jazz

- ❑ Intent

  To be a collaborative development environment to enhance and enrich collaboration in small, informal software development teams

- ❑ Information

  - ▪ Information from the environment's user interface and the local history

  - ▪ informal information (who is online and their status)

- ❑ Presentation

  - ▪ *Jazz band* provides peripheral awareness of the status and activities of other team members

  - ▪ The file names is enhanced using color and icons to show the status

  - ▪ Chats are visibly anchored in the code

A survey of the tool, Jazz

❑ Interaction

up-to-the-minute awareness information by monitoring and displaying information as activities occur

limited controls for determining what is displayed but does not provide support for running queries or other filters

Views in Jazz are coupled and a developer can navigate large chats using hypertext-like links

❑ Effectiveness

it has not been evaluated in a formal user study nor has it been deployed
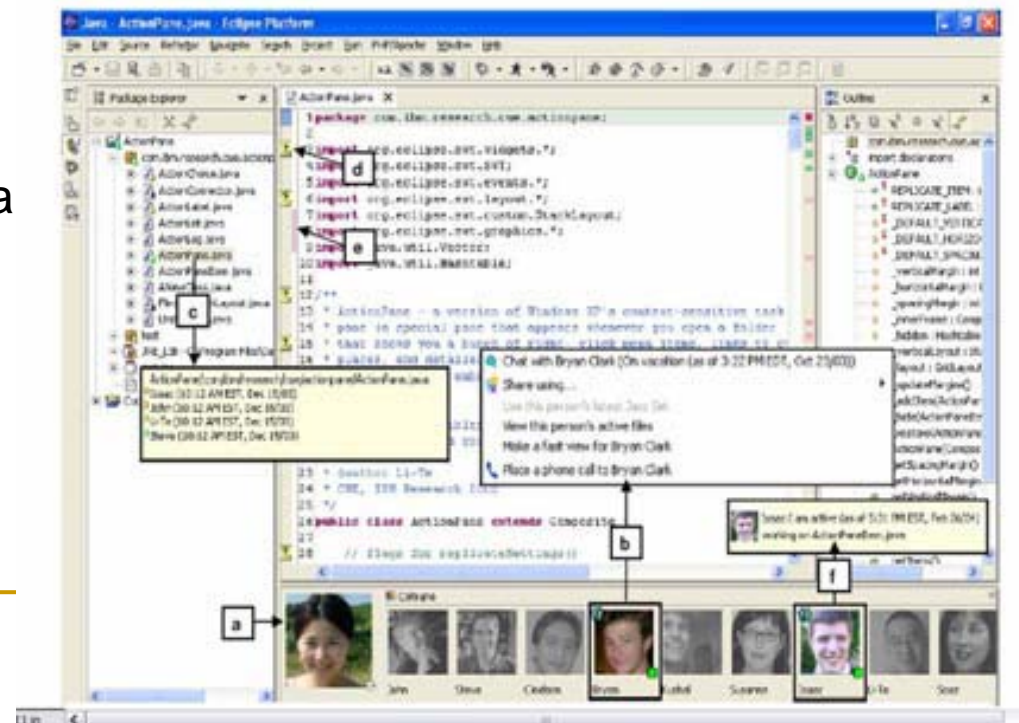
Summary

- The author proposes a framework for describing, comparing and understanding visualization tools that provide awareness of human activities in software development and use it to structure a survey of visualization tools

like and dislike

- **Like**
  - **The structure of the paper is good organized and the description is very clear.**
  - **The key words have been highlighted**
  - **To give sufficient cases for introducing and surveying of the framework**
  - **To provide a overall picture about current visualization techniques and introduce the shortcomings of some visualization tools**

- **Dislike**
  - **The author only simply list the characteristics of the surveyed tools and did not make direct comparison between them**
  - **The author did not classify those tools in his survey**

Thank you!

Questions?