Supporting Collaborative Drawing with the Mask Versioning Mechanism

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Abstract. This work presents a synchronous collaborative graphical editor that implements a proposal of an awareness mechanism of a collaborative artifact evolution. The graphical editor allows real-time, highly interactive collaborative work, using the mask metaphor to help participants in creating new diagram versions without interrupting the interaction as also to provide awareness of the diagram versions created. This paper describes the mask metaphor, the collaborative editor that implements this metaphor and discusses a case study conducted with the use of the tool.

1 Introduction

Collaborative editors aim at providing communication channels, coordination and awareness functionalities for helping participants in recognizing the action of others in the artifact being built. In only one work session, this artifact passes through many stages or versions representing the steps taken for its construction. Basically, a work-space is shared where the artifact under construction is disposed. Each participant can act on the artifact, changing it according to his need or following any coordination protocol.

This work focuses on the issue of artifact evolution. The construction of collaborative work artifacts – especially diagrams – are burdened by the absence of mechanisms that help participants to discuss different alternatives, to make decisions and to follow the evolution of the artifact being built. Some proposals address this issue providing functionalities for changing and version control but few of them help participants to generate parallel alternatives of the same diagram and to discuss, compare and evaluate the content of each version in order to take specific decisions.

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It is argued that a collaborative editor can provide a set of functionalities aiming at: a) representing participants’ consensus over the whole diagram or part of it; b) allowing parallel work and discussions by subgroups analyzing new alternatives that can be merged on the common product; c) helping participants to reach consensus and viewpoint convergence based on the alternatives outlined throughout the editing interaction.

This paper presents the proposal of such collaborative editor – CO2DE –, which aims at achieving the objectives outlined above. The concept underlying CO2DE functionalities is the *mask metaphor*. This concept implements a versioning mechanism for collaborative graphic editing where changes on the artifact can be created independently or not from the overall work, the change context can be identified, and, finally, the participant can discuss and make decisions about those changes.

The paper is structured as follows: Section 2 addresses some issues for being aware of changes in collaborative editors. Section 3 depicts the CO2DE editor functionalities. Section 4 describes case studies conducted to evaluate the use of CO2DE. Finally, conclusions are presented in Section 5.

## 2 Awareness and Discussion of Changes in Collaborative Editors

Text editors are the most popular software tools used in organizations. Products like Microsoft Word or similar offer functionalities for collaborative reviews such as: the creation of annotations in the text, the assignment of colors for modifications made by each author and different text styles to show participants that a review was introduced in the text - for instance, the removed text is stroked through and new text is underlined. However, since each author can only make each modification on his turn, a coordination process or a work protocol must be defined among authors in order to review the text being constructed.

### 2.1 Knowing What Is Going On

In collaborative editing tools, mechanisms adapted from single-user text editors provide useful awareness information for the group. Telepointers, multi-user scrolling bars and fisheye viewers are examples of awareness mechanisms aimed at showing participants’ position in the collaborative text [1].

Collaborative graphical editors also provide shared workspaces where authors share the same drawing or diagram and the modifications are broadcasted to each participant individual view. *Graphical Fisheye Views* [2] is an example of awareness mechanism for helping co-authors in focusing on detailed portions of the workspace and being aware of what are the others’ position and focus. *Radar Views* is another awareness mechanism that shows a minimized view of a diagram. On this view it is delineated each user’s working area at that specific moment [3].

Whatever is the awareness mechanism provided by a collaborative editor, its main objective is to offer what is called *feed through* [4] – any change in the shared objects at the workspace must be remotely reflected to other users.

As much important as the possibility to reflect changes, is the possibility of retrieving the sequence of actions taken by the group over the shared text or diagram.