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MetaChart – Using Creativity Methods in a CSCW Environment

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Abstract

An increasing demand for synchronous collaboration with people in different locations has raised the question for adequate tool support of such collaboration activities in the early phases of projects. As work in the early phases is mainly creative and leads from unstructured ideas to structured scenarios, continuity between those steps is essential. We present here a tool-supported method that supports synchronous group sessions as well as asynchronous work in the same enviro nment, based on a generic approach for information generation and structuring.

1 Introduction and State of the Art

Cooperative work remains separated into two areas: Asynchronous cooperative work and synchronous collaborative and creative work. While there already exist numerous technologies for supporting asynchronous cooperative work (e.g. Kortemeyer, Bauer 1999; Shneiderman 2003), support for direct, synchronous collaborative work is still not frequently used in practice (Wissen et al. 2003), although research in this field exists. This is in some cases due to a lack of practical applicability and of support for creative tasks.

For this reason, there is a demand for tools supporting group sessions – especially creative group sessions – performed to develop new ideas, models and products. Lacking computer-supported methods, such a session is often accomplished only by using paper and pencil. The results generated in these meetings often remain unstructured and unused in the further process. Thus, later projects cannot benefit from the results generated in earlier projects. Existing tools for computer-based support of group sessions often cover only the very early stages of a process and are not able to guide and structure the process further on (Prante et. al. 2002). Another aspect is the support for synchronous collaboration in distributed groups. Standalone software is only applicable for group sessions with one central workspace and the group meeting in the same place. Often it is necessary to work with the results continuously in further process steps and to include co-workers at other locations in the meetings. This leads to problems when using conventional methods or standalone software for group sessions.

A computer-based, distributed application for creative work could solve these problems, but other challenges, like usability and acceptance, will arise and have to be handled using up-to-date methods of human-computer interaction.

2 MetaChart: Method and System in Brief

We have developed a tool-based method supporting distributed as well as local and multi-location group sessions. The approach aims at supporting the early to middle stages of group-based project work. These stages consist especially of generating ideas and developing them into semi- or fully-structured project results.

For supporting these highly creative stages of a project, it is necessary to build on a basic modelling concept, which allows an intuitive way of modelling. The MetaChart approach uses a card-based method for this purpose, which is very similar to meta structuring.

It is based on a few, basic elements. A graphical work space, on which the objects can be moved freely, has been developed, using former results (see e.g. Henderson 1986). On this work space, containers can be placed, which are graphically represented as specialized windows. These windows are called MetaCharts and can contain any set of objects. MetaCharts are responsible for ordering, grouping and structuring ideas. Same as windows in GUIs, they can be positioned freely, can be marked with different colours for better mapping and can be given a name and be associated with other MetaCharts.

These two-dimensional structuring abilities are extended by an hierarchical organisation realised by a containment relation between MetaCharts to model hierarchic card systems. This containment allows to insert MetaCharts as childs into other (parent) MetaCharts with unlimited hierarchy depth. Other relations – like associations – can be introduced through the typed relation feature of MetaChart. Typed relations allow a better structuring in phases following the initial partitioning.

MetaCharts can contain different types of cards, like text cards, graphics and various other file types, which can be directly inserted via drag-and-drop from other applications. Unlike material cards, they are underpinned with complex technical features that allow various enhancements and extensions to the basic card metaphor. Every card and MetaChart has content attributes that allow enhancing the model with semantic descriptions.

MetaCharts and cards behave and appear like a specialized window to enhance conformity with user expectations and suitability for learning (see ISO 1998). All objects can be iconified and restored, which makes working with this surface very similar to working with a common PC environment. Once iconified, all objects show their type, while in the de-iconfied state showing their content. All changes, done on any specific item in the workspace, are shared with all group members instantly, while every group member can have the possibility of direct interaction with the system.

3 Creativity Support

What we have described so far is only the support for noting and structuring ideas. Facilitating idea generation means that in addition creativity techniques must be available. Lots of conventional creativity methods have been developed in the past decades to enhance and support the generation of ideas. The MetaChart system has been designed to support the whole process of generating and structuring ideas. Therefore, it supports a couple of well-known creativity methods like, e.g., meta structuring, brainwriting, visual synektik, random stimulation and mindmapping. Other methods, including implementation of the Creativity Cards, are in development. Different system modes help to apply these methods. First, in the meta-structuring mode, it supports the posting of text cards that can be written by any participator. The subsequent arrangement of these cards and a rating ability that gives every participant a certain amount of rating points to allot to text cards are also offered by the system.

4 Intuitive Interaction Techniques in the Group Environment

In order to support creative work in CSCW environments, it is necessary to complement creativity support with intuitive interface technologies as well as with an appropriate working environment. Presentation media can not only be used for the display of the content but also as an interaction media, where team members can work together on the same content. One scenario for MetaChart is the use of a large interactive wall (see figure 1) with additional computing entities. The large interactive wall becomes active using a laser-based system (Wissen 2001). This allows mouse-like interaction while enabling direct pointing, which is important for wall scenarios, because it allows fast and intuitive position changes. Pen gesture recognition and a camera-based hand gesture recognition system enhance the direct interaction experience and allow direct painting on the large interactive wall. Texts can be entered by handwriting on the wall or on tablet PCs, while voice recognition allows speech input of texts and voice commands.

The existing work scenario also includes the use of pen tablets instead of notebooks or desktop PCs. With pen tablets, the interaction is very similar to the use of paper and pencil and, therefore, provides a more direct coupling mode of use. For mobile use, a specially designed interface to MetaChart on a PDA is also available, which allows mobile access to group sessions and will become a more important usage scenario with the faster data transmission methods currently developing.

For better communication between the members of the group, the program includes peer-to-peer and group-based video and audio conferencing components. This way, group members who join a session from other locations can be integrated in a multimodal way as well as group members can establish private peer-to-peer connections to MetaChart participants inside and outside the session group, e.g., for inquries.

figure 1: Environment for creative CSCW work

5 A Four Step Approach

A major application area of the MetaChart system is the area of collaborative content engineering. The MetaChart system provides mechanisms for modelling content. Content can be grouped according to themes, which can then be graphically related to each other using visible associations. Not only can changes be made by generating new objects via menu, but also by drawing objects and their connections freehand.

This method is especially useful when utilizing direct pointing hardware such as pen tablets or tablet PCs. Gesture recognition algorithms identify manually drawn objects and their connections and convert them directly into MetaCharts and their attached associations. The change performed on the model will be instantly made visible to all other group members who, in turn, can perform their changes.

Pure synchronous work would be possible this way, too, but tests show, that it often prevents the session from developing further, if everyone works at the same time with this very open method. Therefore, it will be necessary to find organisational methods for working together or to implement sophisticated tool-based methods for moderation. Both is considered in the ongoing project work.

MetaChart supports an approach composed of four steps from supporting the early stages of idea generating to the late stages of browsing and changing content.

Data Creation: In the first stage, the focus lies mainly on the generation of ideas and data. This stage is usually a highly creative, synchronous stage. Creativity Methods are used for this stage as well as intuitive input methods like gesture recognition and speech input. Usually, in this stage a working gro up will model the content to be used in the further structuring steps. (see figure 2)

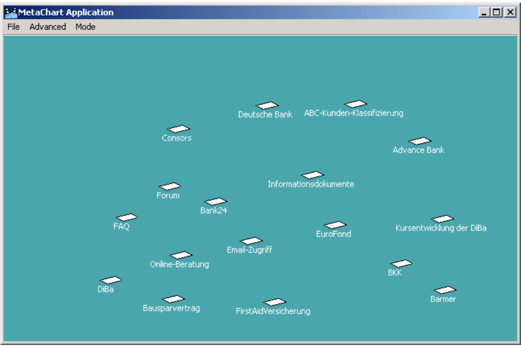

figure 2: Data creation in MetaChart

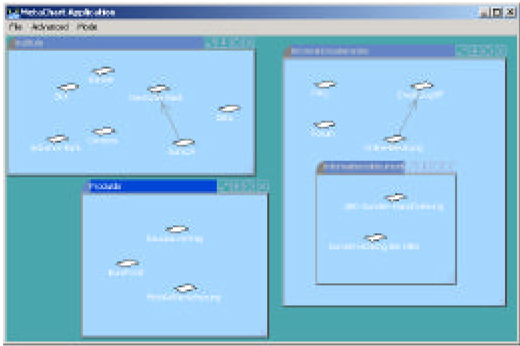

figure 3: Data structuring

Data Structuring: After the initial creation of a normally flat model, which contains an initial collection of ideas, the ideas found have to be structured. This structuring of data is done using associations as well as containment relations. In order to enhance the productivity of structuring, the relations still remain untyped. Containment is modelled by embedding into MetaCharts, which can on their part again be embedded into other (parent) MetaCharts (see figure 3). The MetaChart system offers the possibility to split one session into different new sessions, based on the containment relation. This me ans that different groups can work independently on different parts of the session in parallel.

Input of Content: In a third step, the data is being further refined, while detailed content and data types are being entered. For this purpose, a tree-based tool named MetaChartExplorer allows easy navigation through all objects in the session as well as easy typing of associations (see figure 4). This stage is usually characterised by delegation and asynchronous group work, although the presentation and discussion of the results may take place in a synchronous manner.

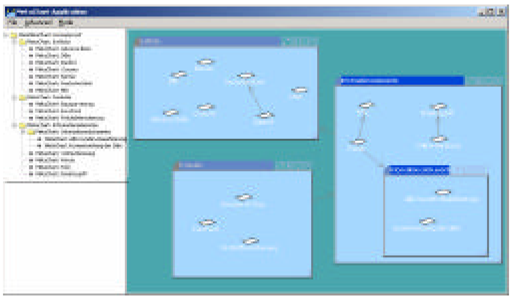

figure 4: Data typing

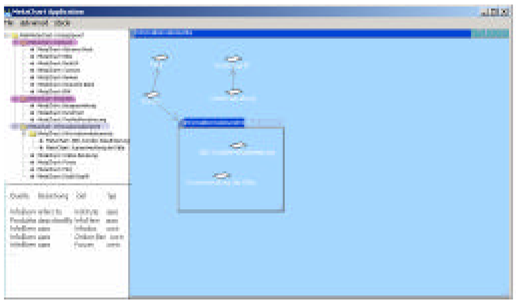

figure 5: Browsing, re-engineering and re-use

Browsing and Data Re-Use: The fourth stage contains methods for browsing the content (see figure 5). The content may also be exported as XML, XTM or RDF. The import and export capabilities allow a connection to other tools (like the ARIS software) and process steps.
Other application scenarios include the development of topic structures and ontologies as well as computer-supported learning. The containment relation allows various other applications that deal with the hierarchic structuring of content.

6 Conclusion

The four stages allow a stepwise creation and refinement of models together with browsing and import/export capabilities. As the MetaChart system is entirely capable of synchronous and asynchronous cooperative work, it allows local as well as distributed groups to join sessions and to go together through the steps of the initial, creative phases. Advanced, multimodal interaction techniques support a fast and intuitive model creation process in group sessions. Application scenarios range from initial idea generation using creativity methods to content modelling and refinement including meta-data description and typed relations.
With its advanced collaboration, modelling and creativity support capabilities, the MetaChart system provides the abilities necessary for IT-based group sessions in the early projects stages.

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