# Virtual Places of Real Work

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## INTRODUCTION

The title of this workshop position paper comes from a participant's comment after the COMIC meeting in VR held in March this year: "It was a lot of fun but it was not a medium of any kind of work". In this paper we want to begin to answer the question what would make a virtual place a place where real work can be done? We will draw on lessons from the COMIC project and see how these might be applied to the visualisation of existing CSCW systems.

The obvious first answer is to provide specific applications which demonstrate the advantages of collaborative virtual reality. Examples of such systems are currently hard to find. Single user examples exist in the traditional areas of visualisation and simulation but collaborative systems are really in their first stages of development. Systems like MASSIVE and Dive are really only just beginning to explore the requirements of shared virtual worlds. They have taken the approach of providing a general framework in which to support relatively simple shared applications. Another approach would be to take existing CSCW systems and exploit the potential advantages of VR to extend their utility and usability. We are going to suggest BSCW [1] and PoliTEAM as examples of working CSCW systems. We will look specifically at how we might use shared visualisations of the BSCW (Basic support for co-operative work) system. Firstly though what is the potential of VR and what are its limitations?

## USES AND LIMITS OF VR

### *USES*

What does the third dimension give us? It provides an extra dimension to display in and move around. Potentially it lets the users and designers show more attributes of data simultaneously. We can encode more attributes from a data set along the three axes and use colour, shapes and animation in 3 dimensions rather than two. In addition the user(s) can inhabit the data landscape and see each other as they work. We can also uses metaphors from real 3D space and users abilities to organise objects and navigate round space to add to the information present on a 2D computer screen.

We can exploit human pattern matching abilities to allow users to observe patterns in a landscape of data. They can view ongoing activities. These might be changes in attributes or the activities of other users. The user can be given past and present views to make comparisons and see what has changed. Users may have multiple views of a landscape and be able to integrate the features between them to make comparisons.

These are all facilities at the *overview* level of a landscape of data. Once users have recognised an interesting feature of a data world we can allow them to zoom into it and show more details at a particular point.

These features of overview, zoom-and-bloom, multiple views, comparisons and so forth, can also be applied to visualisations of users as artefacts, either while they are currently working or a history of previous activities. This ability will be important in virtual organisations involving hundreds or thousands of participants.

If we are building on top of an existing system we can provide extra functionality to the system by providing a VR interface. All the above advantages can operate in a 2D presentation but we can make better use of screen space in a 3D representation.

### *LIMITS*

Despite these potential advantages over 2D displays there are some limits on what is currently possible with VR. Firstly it is easy to produced cluttered displays either because there is too much information or it is difficult to discriminate between different data point displays. This can produce confusing displays where no extra information is provided. This can lead to users becoming lost in the data. This is a common problem in hypermedia systems. It becomes worse in VR systems because of the lack of established conventions, the lack of common interaction models and tool kits, and the variety (and variable quality) and input-output hardware devices used. Again problems of getting lost are not confined to VR. However in VR we can rely on human spatial abilities to help people re-orient themselves and perhaps stop them getting lost in the first instance.

Some work [3] [4] has attempted to provide automatic annotation of data landscapes to overcome some of the above limitations but these attempts still need further empirical testing.

A further limit of VR is the display and interaction with text. Most work involves some interaction with text and the display of 3D text can involve the user in unnecessary flying. We need to be able to integrate the VR world and the 2D text world to allow text interaction. Mode changes (e.g. between walking in VR and then typing text) are usually frowned upon by HCI practitioners but they indicate areas of an interactive system that need more careful design as they can be potentially error prone.

In addition to the problems of visualisation and usability there are further issues connected with the distribution of objects and events in a distributed multi-user virtual environment. These are summarised in [2].

## BSCW

The BSCW system uses the Web to support collaborative document sharing. With minimal changes to the Web server it provides facilities for document storage, group membership, the checking in and out of documents, meta-information on documents and an event-based awareness mechanism.

BSCW provides a set of workspaces which users are able to browse if they are a member of that workspace. Workspaces are shared areas which contain documents, links to other workspaces (or plain Web links), folders and information on group members. Information can also be gathered on the current users of a workspace.

Workspaces themselves can be displayed in a number of views. We can see a descriptive view of the attributes of documents and folders. We can see an event view to find out what actions have been applied to documents and we can see an action view to operate on documents.

## VISUALISING BSCW

BSCW then provides the basic mechanisms of a co-operative system with a currently limited, prototype 2D interface. We could begin by providing a 3D visualisation of Workspaces and their child documents, folders and other related information. Sub-workspaces would be displayed as link objects within the parent workspace or they could be displayed simultaneously so that the user could have an overview of all accessible workspaces. In order to integrate the 2D and 3D views all selections of objects in the 3D view should update the 2D view to show the relevant documents in the web client window.

The Event, Description and Action views could also be displayed simultaneously by coding their attributes onto the visualisation of documents so we did not have to toggle between them. Or documents in a workspace could be arranged according to the actions that were applicable to them or the events they had recently received. Users could simple twist round a display to switch between viewing descriptions or events. Events could trigger animations of their respective objects. High priority events might require user acknowledgement to terminate the animation.

Objects representing members could also be displayed on the periphery of a workspace. Members who are currently active could be highlighted.

This would be a first step in visualising BSCW and takes a simple minded view of mapping existing objects into 3D space. As we discussed above we have greater scope for providing overviews, either as static patterns of attributes or as animations of data evolution, in VR. A common problem with shared documents is the version trail. in BCSW-VR we could provide an animated history of the evolution of a document showing how it changed and who changed it. We can also show how a workspace has grown or shrunk with use over time.

One of the main problems with such a system would be the users understanding of the visualisations chosen. One of the first mechanisms to be provided must be a means of allowing users to select their own visualisations and layouts in cooperation with each other. Our current plans are to provide default layouts of objects and evaluate the use of those layouts in-house before releasing the system to the Web.

## CONCLUSIONS

Current collaborative VR systems provide a framework for seeing other users but not for information sharing. By building on top of existing collaborative systems we can take advantage of their support for collaboration and add more features by extending the range of information that is available to users.


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