Future Scenario for a Collaborative Design Session

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A collaborative design project consists of a team of design partners who are engaged during the period of the project in a particular design task. The group forms a short-lived community with the goal to create a design. The environment in which this is done today, consists of the participants office spaces, completed with equipment such as drawing tables, coffee machines, fax machines, CAD stations, etc. None of these elements reflect the existence of the (temporary) community that a design partner participates in.

In this workshop paper we propose that the current two-dimensional desktop metaphor in a computer does not adequately support collaborative design. The typical 2D-desktop multiple open windows with different applications gives a fractured view of the design project in which by contrast the designer as a person conceives of himself as a whole. Moreover, the sense of place, or a consistent identity in which the design takes place is also lacking. The notion of „virtual environments“ can assist in further developing design support for collaborative design in the future, as is sketched in the following outline.

From his home base, the designer enters his professional 3D world and navigates to the *project world* of his current job. When he enters it, his *home office avatar* changes into the *project avatar* that is specific for this project. Central to the project world is the *workspace*. Connected to the workspace are *private rooms* that can be used when the participant works by himself and there is no direct interaction with the other participants required. A light above the door indicates to the others who are present. The private room need not have the full dimensions of a real room: it can be a transparent box for example that is located somewhere in the workspace.

Colleagues from the office are present in the workspace, as well as partners from other offices and places. They also have personalised avatars for this project. In the space in which the project partners are present is the design object on which they are working. Next to the design object floats an information box. Communication with the participants can be done through various channels, talking either to one, more, or all participants.

Most information that is relevant for the project is associated with the design object. This information can be looked at through the design object in a number of different ways:

- **Geometry view**: the appearance of the design as a three-dimensional

object. This can be looked at in private view by the designer himself, using his project avatar filters, and communal view in which all the participants look at the model in the same way (for discussion purposes). A private view can be transferred to a communal view when a participant (*e.g.* a structural engineer) wants to clarify a point or when a specialised approach is required. Such a transfer is signified by a signal such as a sound, and the current dominant private view can be shown by a different texture on that particular participant's avatar. A design participant can also choose to share his view with someone else.

- **Specific element view**: much data is associated with the design object, and it is possible to access this data by selecting an element or group of elements of the design object and using the proper avatar filter to acquire the information. Selecting can be done in various ways in selection mode, which best suits the user: by looking (elements light up), by pointing, by voice, or by text filter.
- **General information view**: questions that concern the project as a whole (such as time planning and budget) can be addressed by querying the information box that floats next to the design object. An additional feature of the information box is the *project timeline*, which documents the various changes the design has gone through. The timeline is shown as a tree structure, the nodes of which are states of the design object as stored during the design process. In this way, design variants can be stored and readily accessed later by the participants should they chose that a track of development has come to a dead end. The timeline can be either displayed as a fixed structure (to facilitate easier retrieval of an older variant) or dynamically to project the shortest and straightest line of development to the current state.
- **Additional information view**: issues that are related to the design participants themselves are associated with the avatars of the participants. This information can be public or private. The public information can be readily seen by looking at the avatar of that particular participant. A participant can choose to disclose private information to a selection of other persons or the whole group.

During the design session, the participants work on the design object, either in the work space or in the private rooms.
Some propositions that underlay this proposal:

- The 2D-desktop will be replaced by a 3D-environment.
- The appearance of the 3D-environment changes with the purpose of the user, just like a different social event in real life usually is conducted in a different setting.
- For each project, the designer constructs a personality, which is an assembly of particular skills (software) and appearance (avatar).

Feature list

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Tools, media aspects, and features for a good design collaborative program:

- History recorder: An easily navigable tree-like structure that will allow to quickly browse through the history of a design project. Partial restore and re-use of components must be possible to allow use of old ideas again in the process. Possibly with the capability of:
- Hysterical undo: A term defined by Robert Woodbury (see AID '00 proceedings) for an UNDO operation that does not bring you back to the previous stage of the design, but to a different one.
- Transparent multi-user sound quality: Participants should be able to talk and be heard by the others. The quality of the sound does not deteriorate when more than one person is talking, thus making discussions possible.
- 'Rent-a-view': A structural engineer for example, or a building physicist, must be able to share his view of the design object with other participants when he/she/it wants to clarify a point. Others must be able to interact with the view.
- Gesture capture: When a person is making a point about the design, others should be able to see his/her/its gestures as this temporal information gives feedback about the issues or subject at hand.
- Dynamic lock: Permissions to change parts of the design should not be very hard to obtain or change. Obviously, some protocol must be established to ensure people are working on their own parts of the design task.

Software or hardware test

In the eCAADe 2000 conference in Weimar, I participated in a preliminary study of some softwares for shared virtual worlds in order to establish one for the eCAADe community. The test included Active Worlds, Blaxxun, and Holodesk, and were specifically looked at from the perspective of (quote Brown et al. 2000, see eCAADe 2000 proceedings):

- Technical: Bandwidth; required hardware; computational power; accessibility/availability; connection speed; performance under stress; stability
- Educational: does it pose limits on possible content?; pedagogical use;

gallery support; discussion support; does interacting in these worlds transmit additional knowledge/information effectively?; what do you learn from building environments?; is there a steep learning curve for advanced use?

- Human Computer Interface: Time investment/product quality ratio for teachers and students; Speech/text/avatar possibilities and value; discussion of work easily possible?; private/public rooms?; student/eCAADe member/teacher/tourist different id's/possibilities?
- Administration: eCAADe members; current teachers in the system; students; tourists; what are the respective privileges and how are they managed?

Some conclusions:

Active Worlds

Active Worlds is a very active environment and architecture schools already have a presence there. Meetings and lectures take place there frequently. Worlds can be constructed by going to the Builder's Yard and there are other worlds that are of interest to architects.

Plus points

- established and busy world
- facility for whispering (private chat)
- already used for architecture and architectural education.
- proven lecture room facility.

Minus points

- only 10-15 avatars can be seen even if there are more participants than this present
- busy and heavily populated at times.

Blaxxun

Blaxxun has become our favoured environment. It contains most of the features that we regards as important, and does not appear to be as limiting as the other environments in terms of technical restrictions and interface effectiveness. However eCAADe would have to provide a host and server from which the world could be run.

Plus points

- an advanced environment
- a variety of world types
- a participant capacity of 100 (is claimed)
- good navigation features and fast frame rate

Minus points

- heavily populated world with heavy backchat
- a suitable host with an appropriate server must be found.
- there are costs associated with hosting and providing the server
- the security/management aspects need to be clarified

Holodesk

An Internet Explorer engine sits behind Holodesk. In terms of ease of use and clarity of the interface this was the most effective of the environments.

Plus points

- two-way voice chat is supported
- navigation can be either by vrml interface or keys
- easy to use and responsive with a small number of users
- quite good whiteboarding facility
- no sign-up charge
- easy to load up vrml files and avatars
- local loading of worlds maximises bandwidth.

Minus points

- limited capacity for holding a large number of participants in one world.
- new, and relatively untested system, with important developments still to take place
- currently we would need to provide the server and host the world ourselves
- no facility for whispering (private chat)
- voice facility does not work with all soundcards.
- slowed down dramatically during our tests; at a simple meeting/discussion a 300 Mb swap file was generated which crashed the host machine.

Material quoted from:

Brown, Andre and Gavin, Lesley and Berridge, Phil and Achten, Henri and Knight, Mike. Virtual eCAADe Galleries and Meeting Places. Dirk Donath (editor), Promise and Reality - Proceedings of the 18th Conference on Education in Computer Aided Architectural Design in Europe, Bauhaus Universitat Weimar, Weimar, pp. 157-163.

Reference

- Woodbury, R. and Datta, S. and Burrow, A., 2000, Erasure in Design Space Exploration, in Gero, J.S. (ed.), Artificial Intelligence in Design'00, Kluwer Academic Publishers, Dordrecht, pp. 521-543.