A "Multiuser Virtual Reality Environment" for group-communication, interaction and collaboration

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To provide communication facilities to a group of students, typical synchronous communication techniques like video-conferencing are not suitable because of bandwidth limitations. A video-conference with more than two communication partners is a typical point-to-multipoint application. If a true collaboration of all partners is desired, the partner with the smallest bandwidth limits the communication. Applications like teleoperated laboratories, seminars or a virtual cafeteria, require a real interaction between students and the tutor, so a bandwidth-saving way of interaction is required as an alternative to the video based communication. Pure text-based communication (Chat) does not
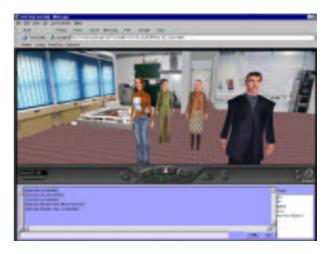

Figure 1: Multiuser VR-Environment

meet our requirements because a multiuser teleoperated laboratory application needs the possibility of real interaction. The tutor has to be enabled to introduce and to explain the details of the experiment by some kind of visual representation of the experiment. In this collaborative virtual environment only one student at a time has active access to the experiment. In a 3D-chat an avatar tries to mimic the behaviour of the user in virtual reality. An avatar is the representation of a real person in virtual reality. The avatar plays the role of the video in a video-conference. Participants can see other users as in a real world scenario. It is possible to provide the user avatars with some simple gestures to visualize for instance agreement or disagreement. 3D-chats have lesser bandwidth requirements than video-conferences, because only events are transmitted.

The realized collaborative environment [1] is divided into two main modules: a rendering and graphics part on the client side and a communication middleware on the server side. On the client side, VRML [2] is used to display the virtual 3D environment. VRML as a text-based language is a powerful, nevertheless simple language to build virtual worlds , which include 3D objects, light sources and animations. VRML specifies an External Authoring Interface (EAI) which can be used by external applications to monitor and control the VRML environment. This is used to update the virtual world with data of the experiment and positions of the other user avatars. The communication middleware is based on the open-source VRML-Multiuser-Software VNET [3] which implements its functionality by Java-VRML coupling via the EAI.

[1] http://prt.fernuni-hagen.de/pro/virtuelle_umgebung/

[2] http://www.web3d.org

[3] http://ariadne.iz.net/~ jeffs/vnet/