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by Edmond Boyer, Benjamin Petit and Bruno Raffin

The Vgate project introduces a new type of immersive environment that allows full-body immersion and interaction with virtual worlds. The project is a joint initiative between computer scientists from research teams in computer vision, parallel computing and computer graphics at the INRIA Grenoble Rhône-Alpes, and the 4D View Solutions company.

A Virtualization gate virtualizes users into graphical objects that capture both their shape and their appearance in real time. These graphical objects can be plugged into any virtual reality application including immersive and interactive applications where users can see and act on virtual worlds. Geographically distant users can also be immersed into a common virtual environment for collaborative applications.

Hardware Setup
Vgate uses several video cameras and 3D modelling tools to build a graphical model of the observed shape in real time (about 20 frames per second). This model is fed into a physical simulation where it becomes a solid object that can act upon other objects. User-centred visualization is provided through a head-mounted display that is tracked with an infrared positioning system (Cyclope). Computations are distributed on a PC cluster to enable real-time execution.

Software Components
Vgate uses the following software:
- Computer Vision: silhouette-based models are computed in real time from the video streams. They are represented with meshes onto which the acquired images are back-projected to produce photorealistic models (http://www.4Dviews.com).
- Simulation: the Simulation Open Framework Architecture (SOFA) runs the physical simulation. It allows objects of very different natures to interact, including rigid bodies, deformable objects and fluids (http://sofa-framework.org).
- Middleware: the Vgate application is developed on top of the FlowVR library, a middleware dedicated to high-performance interactive applications. It enforces modular programming through a hierarchical component model that leverages software engineering issues while enabling efficient execution on parallel architectures (http://flowvr.sourceforge.net/).

Link: http://vgate.inrialpes.fr/

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Images from the VGate project.