



A half-silvered mirror is used to recreate an augmented reality environment that integrates the user's hands and the virtual 3D models in a common working volume. Since the user's hands are behind the translucent mirror, they don't occlude the virtual image, preserving the stereo illusion, and allowing the user to see his/her hands while interacting with the virtual objects. A modified CRT monitor displays a horizontally flipped image, so screen messages, menus and buttons reflected on the mirror can be read normally, facilitating the development of the VR applications on the same workstation.

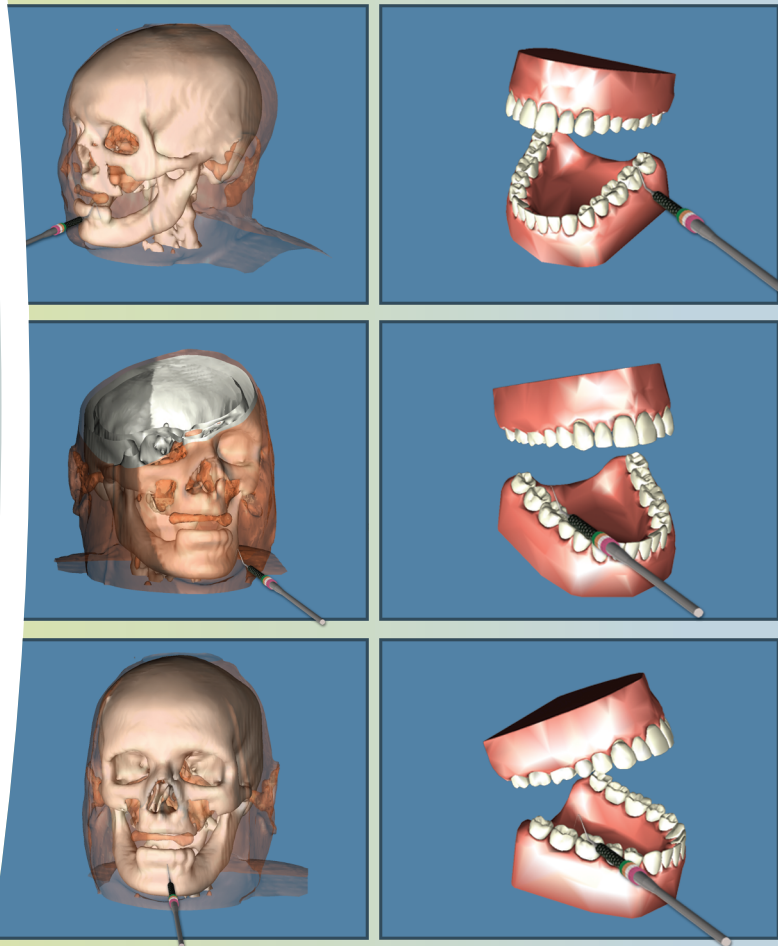
Unlike alternative systems, a real-time electromagnetic system tracks the user's head position and orientation to display the correct user-centered stereoscopic perspective. This guarantees that true graphics and haptics collocation is achieved even when looking at the 3D scene from different angles. In addition, hand tracking allows users to use both hands to interact with the virtual scene. While they can feel tactile sensations with the hand holding the haptic stylus, they can use the tracked hand to move the 3D objects, manipulate lights, or define clipping planes in the same 3D working volume.

pciBIRD™ achieves fast head and hand tracking without requiring an additional networked legacy computer with an ISA slot. A single dual-processor computer handles tracking, graphics and haptics rendering to minimize cost and maximize real time performance.

The monitor screen is positioned outside of the user's field of view so that only the reflected image is viewable to minimize distractions.

ImmersiveTouch™ comes with a cross-platform C++ API to easily develop haptics-based applications, eliminating the need to integrate multiple libraries. These are:

- Coin 2.0 (Open Inventor) for graphics rendering
- VTK 4.5 for volume processing
- GHOST 4.0 SDK for haptic rendering
- pciBIRD API for head and hand tracking
- FLTK for the GUI and the OpenGL interface
- OpenAL for the 3D audio



"Haptic Visible Women" (left) and "Periodontal Training Simulator" (right) are two applications currently under development using the **ImmersiveTouch™** system at the University of Illinois at Chicago.



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