Virtual Retinal Displays — A New Paradigm in Display Technology

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A novel approach has been developed to manipulate photons directly to form a full color image and use the viewer own retina as the "viewing screen." The applications of VRD technology include military head and helmet mounted displays, image guided surgery, and personal communications. VRDs enhance the Virtual Reality experience by providing high resolution, brilliant, full color images that can be used in numerous applications. Microvision Inc. has advanced the core technology from monochrome VGA to full color SXGA display capability over the last two years. This presentation discusses the basics of VRD technology and it potential in the Synthetic Vision market.

Touch a Virtual Object Just as it is Seen

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Several efforts have been made for the construction of the virtual haptic space. Recently, adding to the conventional force/torque displays, shape displays, which can represent haptic shape of a virtual object, are being studied worldwide. They are called robotic graphics or haptic graphics, and are expected to play the role that computer graphics do for the representation of visual shapes of a virtual object. Coherency of visual information and haptic information, i.e., to feel a virtual object at the place where it is seen with a haptic shape that is the same as the visual shape, is becoming a very important issue of haptic display.

By using both Head Mounted Projector (HMP) and Active Environment Display (AED) with retro-reflective material, make it possible to see a virtual object and feel it by a fingertip just as it is seen. In the system, a user wears a lightweight passive seven-degree of freedom exoskeleton goniometer that measures the position and orientation of a fingertip. A six-degree of freedom impedance controlled manipulator, which is called "Active Environment Device (AED)," moves to anticipate and if necessary counter the user's action to display contact with virtual surfaces, edges and vertices. The wrist of the manipulator carries a device with a complex surface geometry as well as convex and concave edges and flat surfaces. It is thus possible to simulate contact with continuous surfaces and edges by moving the Shape Approximation Device (SAD), which is painted with retro-reflective material. A User wears a Head Mounted Projector (HMP), which projects a visual virtual object on SAD as a screen. Thus the user can feel exactly what (s)he sees at the position it is observed with the haptic shape just the same as the visual one.

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