



# Haptics... Reach Out and Touch Some Data



UNTIL RECENTLY, COMPUTERS COULD ONLY SEND information to your eyes or ears. A new technology, called haptics (from the Greek word *haptikos*, "to touch"), is giving computers the capability to send information to your hands, too. Haptics equipment uses vibrators, electromagnets, motors, and brakes to add a variety of tactile sensations to human-computer interfaces, so you can actually feel information.

Today, video gamers are using haptics-equipped mice, joysticks, and steering wheels that deliver jolts and rattles synchronized to the games' events. When players drive over a bumpy road, or get hit by a plasma torpedo,



## IMMERSION MEDICAL'S CATHSIM

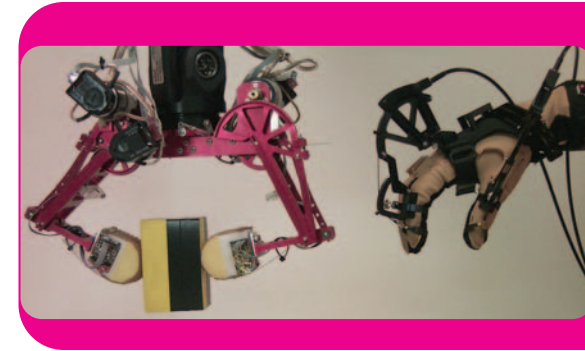
Immersion Medical's CathSim uses tactile feedback and a computer representation of a human arm to instruct nurses and doctoral students on how to insert a catheter through the skin of a patient and guide it through an artery. Students can feel the "pop" of the needle as it penetrates the skin and enters a vein.



Clockwise from top left: Ryan McKay/Getty Images - Image courtesy of Immersion Corporation - Image courtesy of Immersion Corporation - Image courtesy of Logitech, Inc.

they'll feel it. Animators are using special gloves equipped with force-feedback mechanisms that enable them to sense the resistance of virtual blobs of onscreen clay that they can mold into cartoon characters. Car manufacturers are including dashboard controls that vibrate, stick, and click so that information is imparted to drivers' fingers, instead of forcing drivers to take their eyes off the road.

In the near future, haptics will have its greatest impact in the field of medicine. Doctors are learning how to perform complicated and risky surgical procedures by practicing on machines designed to mimic the sensations of prodding, cutting, and guiding surgical instruments in the human body. Immersion Medical, a Gaithersburg, Maryland, company that manufactures haptics-based medical training



## CYBERGLOVE

Designed by Dr. Mark Cutkosky at Stanford University's Dexterous Manipulation Lab, the Cyberglove remotely controls a robot arm. The robot arm does whatever the user's hand does. A force-feedback system in the Cyberglove allows the user to "feel" objects at a distance.



**MODELING SYSTEMS.** Sensable's Freeform modeling system allows industrial designers, sculptors and 3D artists to mold computer models as they would from a block of clay. Designers at Adidas, Disney, Hasbro, LEGO, and Honda use the company's haptics modeling systems.

prime time. Major design challenges lie ahead before shoppers will be able to feel the difference between a silk purse and a sow's ear.

## PROVOCATIONS...

Will people add haptic content to their home pages?

Will lovers be able to hold hands remotely with haptics?

— Mark Frauenfelder

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IMMERSION  
[www.immersion.com](http://www.immersion.com)

SENSABLE TECHNOLOGIES  
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## LOGITECH'S IFEEL MOUSE



Logitech's iFeel mouse uses a motor to send distinct vibrations to users' hands when

they guide the cursor over elements on a computer display. For example, the mouse will create the sensation of a "speed bump" when crossing the border of a window. Other elements on the desktop can be customized to feel "metallic," "rubbery," or "spongy."

equipment, has sold hundreds of devices to teach doctors how to use vascular catheters and endoscopes. Immersion's CathSim uses tactile feedback and a computer representation of a human arm to instruct nurses and medical students how to insert a catheter through the skin of a patient and guide it through an artery. Students can feel the "pop" of the needle as it penetrates the skin and enters a vein. The software can simulate a variety of different kinds of patients, from a child with small veins to an IV drug user with toughened veins. In years to come, haptics devices will be used to help doctors perform real surgery on patients hundreds of miles away.

Looking beyond, haptics could be used to help online shoppers get a feel for the quality of materials used in merchandise offered for sale on a Web site. Early prototypes of "texture simulators" use dozens of tiny metal pegs arranged in arrays of columns and rows. Depending on the data the device receives, certain pegs will protrude and other will recede, providing the illusion of corduroy, sandpaper, polished wood, beard stubble, or any other textured surface. Because the heat transfer characteristics of materials are an important part of accurately simulating a surface, the pegs can be heated or cooled to the appropriate temperature. So far, textural haptics aren't ready for