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# Design of Perceptualization Applications in Medicine

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## The Touchy Subject of Haptics

*After more than 20 years of research and development, are haptic interfaces finally getting ready to enter the computing mainstream?*

**E**VER SINCE THE first silent-mode cell phones started buzzing in our pockets a few years ago, many of us have unwittingly developed a fumbling familiarity with haptics: technology that invokes our sense of touch. Video games now routinely employ force-feedback joysticks to jolt their players with a sense of impending on-screen doom, while more sophisticated haptic devices have helped doctors conduct surgeries from afar, allowed desk-bound soldiers to operate robots in hazardous environments, and equipped musicians with virtual violins.

Despite recent technological advances, haptic interfaces have made only modest inroads into the mass consumer market. Buzzing cell phones and shaking joysticks aside, developers have yet to create a breakthrough product—a device that would do for haptics what the iPhone has done for touch screens. The slow pace of market acceptance stems partly from typical new-technology growing pains: high production costs, the lack of standard application programming interfaces (APIs), and the absence of established user interface conventions. Those issues aside, however, a bigger question looms over this fledgling industry: What are haptics good for, exactly?

Computer scientists have been exploring haptics for more than two decades. Early research focused largely on the problem of sensory substitution, converting imagery or speech information into electric or vibratory stimulation patterns on the skin. As the technology matured, haptics found new applications in teleoperator systems and virtual environments, useful for robotics and flight simulator applications.

Today, some researchers think the big promise of haptics may involve

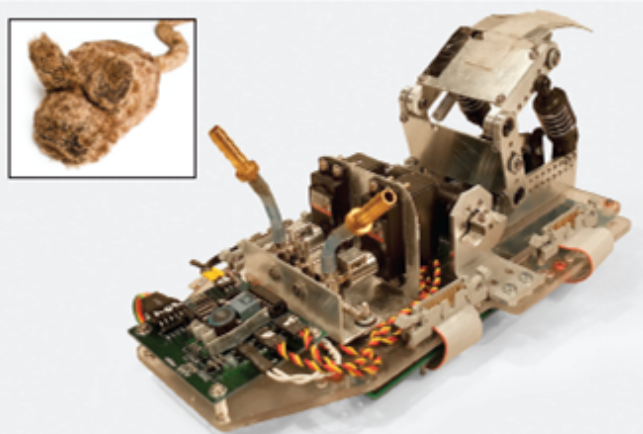
moving beyond special-purpose applications to tackle one of the defining challenges of our age: information overload. For many of us, a growing reliance on screen-based computers has long since overtaxed our visual senses. But the human mind comes equipped to process information simultaneously from multiple inputs—including the sense of touch. “People are not biologically equipped to handle the assault of information that all comes through one channel,” says Karon MacLean, a professor of computer science at the University of British Columbia.

Haptic interfaces offer the promise of creating an auxiliary information channel that could offload some of the cognitive load by transmitting data to the human brain through a range of vibrations or other touch-based feedback. “In the real world things happen on the periphery,” says Lynette Jones, a senior research scientist at Massachusetts Institute of Technology. “It seems like haptics might be a good candidate

for exploiting that capability because it’s already a background sense.”

As people consume more information on mobile devices, the case for haptics seems to grow stronger. “As screen size has become smaller, there is interest in offloading some information that would have been presented visually to other modalities,” says Jones, who also sees opportunities for haptic interfaces embedded in vehicles as early warning systems and proximity indicators, as well as more advanced applications in surgery, space, undersea exploration, and military scenarios.

While those opportunities may be real, developers will first have to overcome a series of daunting technical obstacles. For starters, there is currently no standard API for the various force feedback devices on the market, although some recent efforts have resulted in commercial as well as open source solutions for developing software for multiple haptic hardware platforms. And as haptic devices grow



About the size of a cat, the Haptic Creature produces different sensations in response to human touch. Insert: The Haptic Creature with furry skin.

PHOTOGRAPH BY STEVE GRANITZ



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# Perceptualization



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The potential of applying **user centered design** methods to design and engineering of **medical applications** that strive to exploit the benefits of **perceptualization**, with a particular focus on **haptic feedback**.



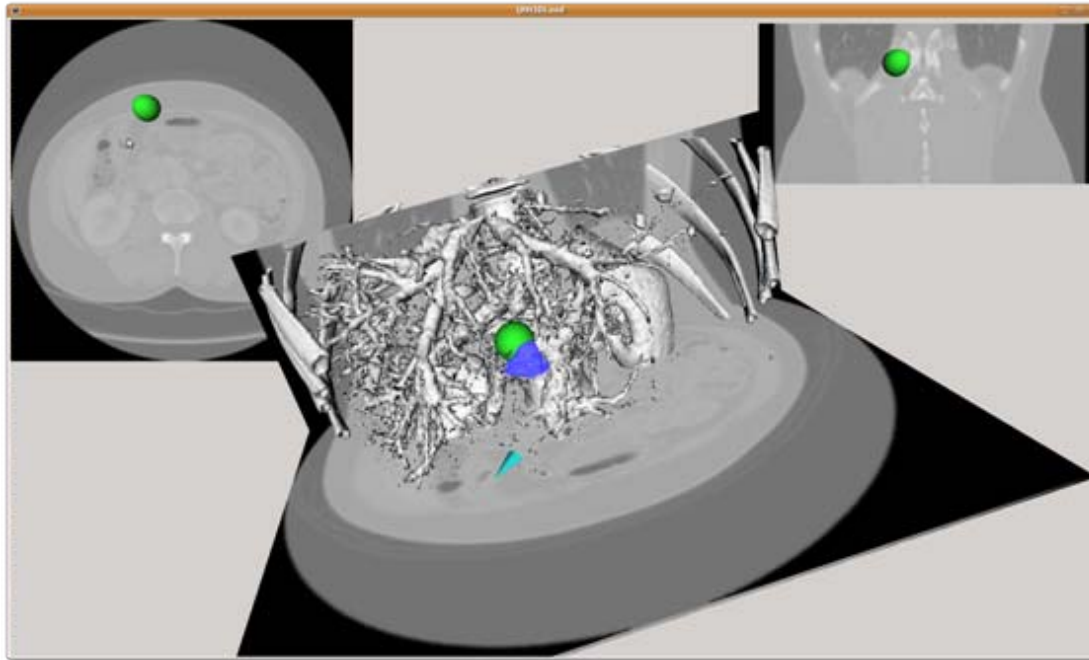
# The oral surgery simulator



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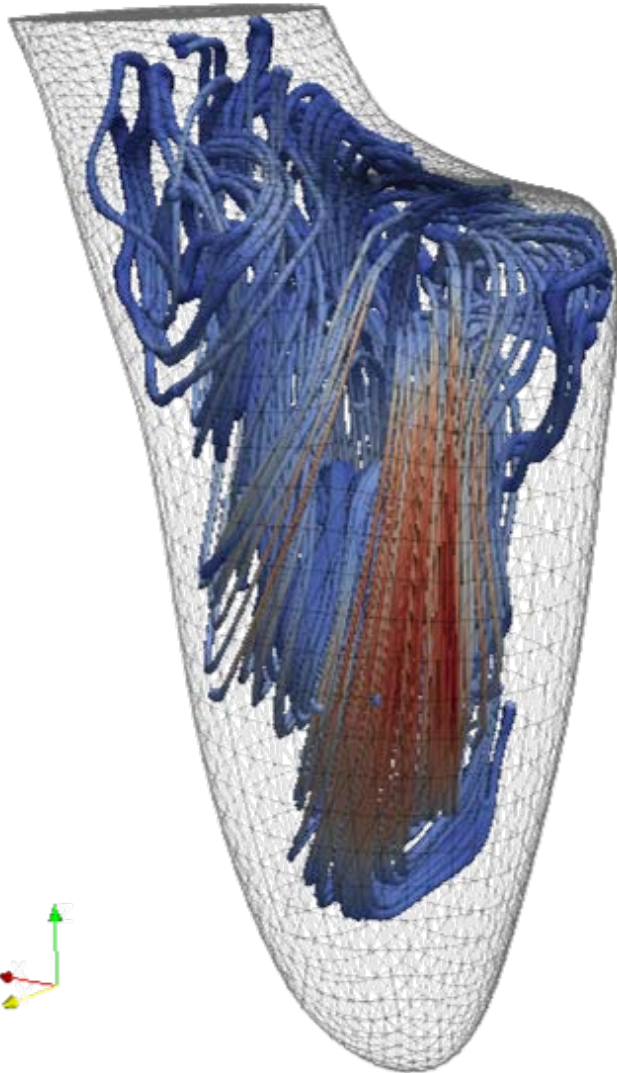
# Collaborative surgical planning tool



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# Heart simulation



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# Design focus transition



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## Main interests

- Interaction design: generation of design alternatives using UCD
- Haptic feedback (obviously)
- Medical applications
- Productification and entrepreneurship



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