

## Tactile technology guaranteed to send shivers down your spine

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A new tactile technology developed at Disney Research, Pittsburgh (DRP), called Surround Haptics, makes it possible for video game players and film viewers to feel a wide variety of sensations, from the smoothness of a finger being drawn against skin to the jolt of a collision.

The technology is based on rigorous psychophysical experiments and new models of tactile perception. Disney will demonstrate Surround Haptics Aug. 7-11 at the <u>Emerging Technology</u> Exhibition at SIGGRAPH 2011, the International Conference on Computer Graphics and Interactive Techniques in Vancouver.

In the demonstration developed in collaboration with Carnegie Mellon University and others, the technology will enhance a high-intensity driving simulator game in collaboration with Disney's Black Rock Studio. With players seated in a chair outfitted with inexpensive vibrating actuators, Surround Haptics will enable them to feel road imperfections and objects falling on the car, sense skidding, braking and acceleration, and experience ripples of sensation when cars collide or jump and land.

"Although we have only implemented Surround Haptics with a gaming chair to date, the technology can be easily embedded into clothing, gloves, sports equipment and mobile computing devices," said Ivan Poupyrev, senior research scientist at DRP, who invented and developed Surround Haptics with Ali Israr, also of DRP. "This technology has the capability of enhancing the perception of flying or falling, of shrinking



or growing, of feeling bugs creeping on your skin. The possibilities are endless."

The DRP researchers have accomplished this feat by designing an algorithm for controlling an array of vibrating actuators in such a way as to create "virtual actuators" anywhere within the grid of actuators. A virtual actuator, Poupyrev said, can be created between any two physical actuators; the user has the illusion of feeling only the virtual actuator.

As a result, users don't feel the general buzzing or pulsing typical of most haptic devices today, but can feel discrete, continuous motions such as a finger tracing a pattern on skin.

The phenomenon of phantom sensations created by actuators has been known for more than 50 years, but its use in tactile displays has been limited because of an incomplete understanding of control mechanisms. DRP researchers were able to develop their control algorithm by systematically measuring users' ability to feel physical actuators vs. virtual actuators under a variety of stimulation levels. They then developed control models that were validated by further psychophysical experiments.

In addition to enhancing user experiences with interactive games, movies and music, Surround Haptics' underlying technology promises to provide new tactile means of communication for the blind, emergency workers, vehicle operators, athletes and others.

Provided by Carnegie Mellon University

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