Tactile animation makes it easier to design rich haptic sensations

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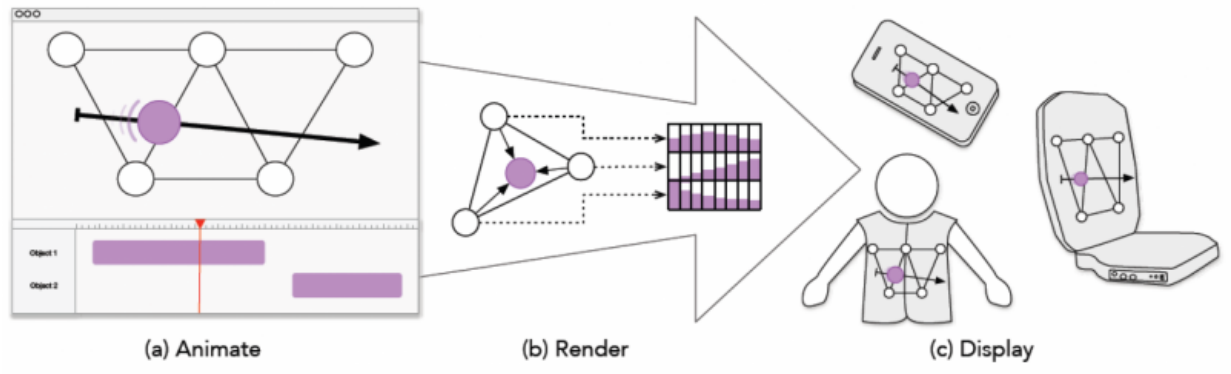

Immersive media experiences that engage an audience's sense of touch are easier to create with the help of a new haptic design process, called tactile animation, developed by Disney Research.

The new process is akin to animation software, allowing the designer to focus on how a haptic effect will unfold over space and time rather than having to concentrate on individually controlling each actuator to create tactile feedback.

"A visual animator who may not be experienced with haptic effects but already knows how to use time and space to portray motion can use our

tools to create rich haptic sensations that enhance a movie, game, or other entertainment," said Ali Israr, a senior research engineer at Disney Research.

Israr, along with Oliver S. Schneider and Karon E. MacLean of the University of British Columbia, developed what they call a "tactile animation object" - an abstract representation of a haptic sensation that can be used to design the haptic effect - and implemented it in Mango, an tactile animation tool and pipeline.

They will present their work at UIST, the ACM Symposium on User Interface Software and Technology, Nov. 8-11 in Charlotte, NC.

"Experts in haptic effects can create an amazing variety of sensations using arrays of actuators that vibrate a person's skin," said Jessica Hodgins, vice president of research at Disney Research. "We believe these effects can be even more compelling if designers can worry less about the mechanics of the effects and think more about the overall experience."

Though these vibrotactile arrays include a number of separate actuators, they can create what feels like a continuous sensation, thanks to a perceptual trick that can generate phantom sensations between actuators. But effects designers now must control each actuator individually and tediously create the effects frame by frame.

The tactile animation object, by contrast, can be used to control the haptic effect and iteratively explore how changing various parameters can enhance the effect without having to worry about the underlying actuator arrangements. This method applies to a variety of actuator array layouts and to arrays with different numbers of actuators.

With the Mango tool, users manipulate the tactile animation object with

a visual interface. User can move the object freely in space in real-time, change the intensity or duration of the sensation, or create a patch for the sensation, among other parameters.

"It felt very much like an animation tool," said one veteran animator with little experience with haptics who was one of six media professionals who evaluated Mango as part of the study.

The research team interviewed industry experts when they began developing the tool. This exercise resulted in a set of industry requirements that guided development, such as using an animation window to draw and control tactile animation objects, providing path tools for defining and storing motion paths of objects, and employing haptic rendering schemes to compute the output waveforms for each actuator.

Israr said tactile animation promises to have applications beyond the vibrotactile arrays used in back-based pads, which were used in this study. It also could be used with arrays in gloves, with 3-D animations such as vests or jackets that wrap around the body, or non-vibrotactile devices, such as ultrasound-based mid-air displays or height displays such as a grid of pins.

More information: "Tactile Animation by Direct Manipulation of Grid Displays-Paper" [PDF, 4.31 MB]

Provided by Disney Research