News from the Field

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This is a new feature in the IEEE Transactions on Haptics in which we will highlight new areas of research and development or interesting new devices in haptics. In this first feature, we present the four finalists for the “Best Demo” award at the Haptics Symposium held in Houston in February 2014. More than 50 demos were displayed at the conference and these four demos were selected as finalists by the Awards Committee. The winner of the “Best Demo” award was “Presenting Virtual Stiffness with Suction Pressure” by Lope Ben Porquis, Daiki Maemori, Naohisa Nagaya, Masashi Konyo, and Satoshi Tadokoro from Tohoku University, Japan.

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Editor-in-Chief

Presenting Virtual Stiffness with Suction Pressure
Lope Ben Porquis, Daiki Maemori, Naohisa Nagaya, Masashi Konyo, and Satoshi Tadokoro
The authors are with Tohoku University, Sendai, Miyagi, Japan.

This hands-on demo was conducted to study how perceived stiffness could be modulated by “controlling” the force induced by suction pressure stimuli. The force exerted on a handheld tool is measured and that signal controls the tactile stimuli delivered to the digits on the contact points on the tool. The purpose of the study was to obtain a function for perceived stiffness which could be used in augmented reality applications of the pen. A psychophysical function relating perceived force to suction pressure is used to modulate the intensity of the tactile stimuli with respect to the reaction force on the probed object. By treating the perceived and physical forces as equivalent, we used the force signal to drive the suction stimuli. We speculate that the sensations of force produced by the suction stimuli improve force sensation and hence, perceived stiffness. Initial experimental results suggest that the perceived stiffness of a spring appeared to increase with increasing gain of the force signal. See the video clip “Porquis video.avi,” which is available in the Computer Society Digital Library at http://doi.ieeecomputersociety.org/10.1109/TOH.2014.232291.

Encountered-Type Haptic Interface Using Magneto-Rheological Fluid for Surgical Simulators
Teppei Tsujita, Takuya Kameyama, Atsushi Konno, Xin Jiang, Satoko Abiko, and Masuru Uchiyama
T. Tsujita, T. Kameyama, X. Jiang, S. Abiko, and M. Uchiyama are with Tohoku University, Sendai, Miyagi. A. Konno is with Hokkaido University, Sapporo, Japan.

During surgery, a surgeon uses a variety of surgical instruments. Therefore, a haptic interface should be able to display reaction forces through various surgical instruments. Based on this concept, a novel encountered-type haptic interface using Magneto-Rheological (MR) fluid for surgical simulators has been developed. This haptic interface consists of a force display using MR fluid and a motion table which moves a container of the fluid. In this demonstration, the force display is exhibited and users can experience cutting MR fluid with a knife. By varying the intensity of current applied to the electromagnetic coils, the magnitude of the resistance force can be changed. Also, users can feel vibrational force when a sinusoidal current is applied.

In addition, the role of the motion table is explained by showing the behavior of the MR fluid. See the video clip “Tsujita video.mov,” which is available in the Computer Society Digital Library at http://doi.ieeecomputersociety.org/10.1109/TOH.2014.232291.
Kinesthetic Physical Interaction with a Multi-Handed Tactile Display
Ashley L. Guinan, Markus N. Montandon, Andrew J. Doxon, and William R. Provancher
The authors are with the University of Utah, Salt Lake City, USA.

Interaction with a virtual environment is provided to a user through a device equipped with tactile feedback and six degree-of-freedom spatial position sensing. Our tactile feedback device uses three sliding plates positioned around the handle to provide skin stretch feedback to a user’s palm. Our two-handed tactile feedback device allows for independent hand motions and provides tactile feedback that creates a feedback experience that is more kinesthetic in nature than expected of a pure tactile feedback system. This allows us to create the sense of force and torque feedback over a large workspace. Our device and demonstrations include cooperative multi-handed interactions that portray fundamental physical interactions such as mass, stiffness, and damping. These physical interactions are fundamental as they are the building blocks of virtually every dynamic model. Various virtual environments will be used to demonstrate these physical interactions. See the video clip at http://youtu.be/uD3hlYr1f4.

Variable Friction and Multi-Actuator Vibrotactile Haptics on a Tablet Computer
Craig Shultz, Joe Mullenbach, Michael A. Peshkin, and J. Edward Colgate
The authors are with Northwestern University, Chicago, USA.

Variable friction and multi-actuator vibrotactile haptics effects have been demonstrated separately from each other in the past. In this application, we present a TPad Tablet, containing a variable friction screen, combined with four independently controlled vibrotactile actuators. This device can thus render both types of effects. Users can receive localized lateral force information as their finger glides across the screen, and they can feel directional vibration information through their hand holding the device. Directionality with the vibrotactile actuators is achieved through the use of apparent haptic movement and phantom sensation. An example application has been developed in which users interact with a virtual ball on the surface of the tablet. Users can indirectly feel the ball interact with its environment as it rolls across the screen or bumps into the sides. They can also interact with the ball directly to feel collision forces right at their fingertip.