Asia Haptics 2014 was the first haptics conference featuring only hands-on demos with no podium presentations during the main conference. During the one and a half day main conference on November 19 and 20, 2014, a total of 58 peer-reviewed and 10 late-breaking demos were showcased to some 210 conference attendees from all over the world. Due to the obvious requirement of having to move equipment to the conference venue, a majority of the demos came from Japan. In addition, there were a number of demos from the neighboring country of Korea and from outside of Asia. The atmosphere was paced and relaxed for the demo presenters as well as the attendees, allowing ample opportunities for hands-on and (in some cases) feet-on interactions and technical discussions.

The idea of an all demo haptics conference came about when Prof. Hiroo Iwata, general chair of Asia Haptics 2014, first considered hosting a haptics conference in Asia. He wanted to create a different and unique experience for the conference goers. Since hands-on demos have always been essential for understanding haptics work, it seemed worthwhile exploring the option of having demonstrations as the main event of a conference as opposed to oral presentations.

The conference venue consisted of two large halls, each comfortably holding 30+ demo stations. In the main hall, a large screen and chairs were set up. Each demo was introduced by its presenter at the demo station and broadcast live on the large screen (see Fig. 1 below). The conference attendees sat in front of the screen or followed the camera man around as oral presentations progressed. This arrangement gave the audience a nice “preview” of the demonstration in situ. The 68 demos were organized into three half-day sessions. Each session started with a 90-min period of introductions by the demo presenters, followed by a 2-hour demonstration period.

The demos covered a wide range of technologies and applications. There were thermal, force-feedback, electrocutaneous, ultrasonic, and vibrotactile haptic displays. Among the honorable mention winners, there was a pulsation simulator with a concurrent temperature display that greatly enhanced the realism at the contact point. There were two ultrasonic displays that allowed the attendees to reach out and touch an object in thin air. Another allowed museum goers to touch objects behind protective glass casings. There were also a haptic ice hockey table with an electrostatic friction display and built-in capacitive position sensing, a haptic augmented reality system with modulated stiffness and friction, and a surprisingly compelling multi-digit softness display using flexible sheets wrapped around multiple fingers. The best demo award, which also received the people’s choice award, went to the “Highly Flexible and Transparent Skin-like Tactile Sensor” from ETRI (see Fig. 2). As shown in Fig. 2, the sensor sheet responded only when it is pressed but not when it is only bent. This demo, as well as those that received honorable mention, are described below.

Overall, the demo-focused format worked well at Asia Haptics 2014. The conference attendees appreciated the amount of time available per demo as compared to other haptics conferences. The live-demo introduction was effective and helped to cut down the repeated instructions often required of demo presenters. However, the 2-hour long demo sessions could be physically draining for both the demo presenters and the attendees. There were also fewer opportunities to discuss research at the conference. It was therefore suggested that plenary talks or even plenary demos be incorporated into the future conference schedule to break up the long days and to provide focused discussion of emerging research topics. At the end of the conference, it was decided that future Asia Haptics conferences will be held in even years during the latter part of the year to complement Haptics Symposium and EuroHaptics, using the same format of featuring hands-on demos. The next Asia Haptics conference will be held on November 29 to December 1, 2016 in Kashiwanoha, Japan, a beautiful town outside the city of Tokyo.
ETRI (Electronics and Telecommunications Research Institute) has developed a skin-like force sensor array that works on curvilinear surfaces such as the human arm. The sensor is thin (thickness: <150 \mu m), flexible and highly transparent (transmittance: as high as 90 percent). It is capable of simultaneously detecting position and contact force at each pixel in a 3 x 4 matrix with a fast response time (response delay: <10 ms), high sensitivity (as high as 16 percent/N) and high bendability (10.8 percent sensitivity degradation at a bending radius of 1.5 mm) in response to a dynamic input force (0-3 N).

The sensor consists of polymer-based multiple waveguides, a light source, photodetectors, and a touch layer. The sensor can detect contact force by monitoring the intensity of the light at the photodetector since the amount of light scattered from each bare core in the waveguides changes with the input force when the touch layer is in contact with the core. Due to the fact that light passing through the waveguide is scattered and responds to only a pressurized contact in vertical direction, the sensor array is highly robust against mechanical stress or strain induced by placing it on curvilinear or uneven surfaces. This feature allows the sensor to be utilized as an input sensor for wearable devices, an artificial skin sensor for robots, and a touch panel component for flexible displays.
HONORABLE MENTIONS

A Flexible PDMS-Based Multimodal Pulse and Temperature Display
Simon Gallo and Hannes Bleuler
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Our research focuses on the effect of multimodal haptic feedback on the intuitiveness of tele-operated surgical interfaces. With this objective, we designed a flexible PDMS-based tactile display that provided fast temperature changes and pulsating cues on the user’s skin. The display consists of a main body with a hollow chamber covered by a thin deformable membrane. The tactile feedback is achieved by controlling the pressure and temperature of a water stream circulating through the display. We mounted this multimodal display on a commercial force feedback device and implemented a tele-palpation simulation during which the user can palpate a virtual tissue and feel its temperature, compliance and the pulsation of arteries hidden beneath the visible tissue. The combination of these haptic sensations resulted in a very realistic sensation of touching a “living” tissue.

Adding Texture to Aerial Images Using Ultrasounds
Yasuaki Monnai, Keisuke Hasegawa, Masahiro Fujiwara, Kazuma Yoshino, Seki Inoue, and Hiroyuki Shinoda
The authors are with the University of Tokyo, Japan.

In our demonstration, we presented a method to add texture to mid-air floating intangible images using ultrasound. Recently, the technology of mid-air floating imaging has been emerging. In this application we superposed tactile texture on a floating image using acoustic radiation pressure. The tactile texture can be altered by modulating the ultrasonic waveform. The system recognized finger position with infrared sensing and the tactile sensation was presented selectively on the users’ fingertips without requiring that they wear extra markers. Participants experienced the novel visuo-tactile interaction completely in free space. See the video at https://www.youtube.com/watch?v=uARGRlpCWg8.

Built-In Capacitive Position Sensing for Multi-User Electrostatic Visuo-Haptic Display
Taku Nakamura and Akio Yamamoto
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This demonstration features a multi-user electrostatic visuo-haptic display with built-in capacitive position sensing. The system provides independent haptic stimuli to two users through contact pads by means of electrostatic friction modulation. Using the same electrodes as haptic stimulation, the system detects the position of each pad. In the demonstration, people can enjoy a virtual hockey game while feeling haptic feedback on their fingers. See the video at https://www.youtube.com/watch?v=eePfcwRtSM.
Normal and Tangential Force Decomposition and Augmentation Based on Contact Centroid
Sunghoon Yim, Seokhee Jeon, and Seungmoon Choi
S. Yim and S. Choi are with Pohang University of Science and Technology, Korea. S. Jeon is with Kyung Hee University, Korea.

This demonstration presents a new haptic augmented reality approach that selectively increases or decreases the stiffness and friction of a real object. To this end, we extract the normal and the tangential force component from the reaction force using a method based on contact centroid. The contact centroid is defined as a point on the surface of a contact probe at which the moment is parallel to the surface normal. The contact centroid can be derived using the reaction force and the torque measurement at the center of the probe without any prior knowledge of the object. Using the surface normal at the derived contact centroid, the reaction force can be decomposed into two orthogonal force components, and they are selectively amplified or diminished. An application of this technique involves a breast phantom embedded with a harder tumor. When palpating the phantom, the system scales up the stiffness and scales down the friction in order to increase the sensation of inhomogeneity, leading to a significant improvement in the detectability of the tumor. See the video at http://www.youtube.com/watch?v=VnlWqHE6mVY.

Rendering Different Sensations to Multiple Fingers in a Multi-Digit Softness Display: Pulsation and Distributed Softness
Toshiki Kitazawa and Aki Yamamoto
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Two unique softness sensations were demonstrated using a multi-digit softness display. The display has three independent softness rendering modules to realize softness rendering to multiple fingers. By controlling the modules independently, one demonstration rendered pulsating sensation within a soft body, resembling a vessel or a heart within a human body. The other demonstration rendered a hard object contained in a soft body. Both demonstrations were integrated with visual information to enhance reality.

Generating Vibrotactile Images on the Human Palms
Keisuke Hasegawa and Hiroyuki Shinoda
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We have created a system which generates vibrotactile images on the surface of bare human palms. It simultaneously projects visible images by a video projector and produces non-contact vibrotactile stimuli using focused airborne ultrasound on the users’ skin. The vibrotactile images can be moved smoothly owing to the ultrasound phased array technique employed in the system. The vibrational texture can be tuned with amplitude-modulation of ultrasound at the focal point. Our proposed system does not postulate that users wear specific devices for sensing tactile stimuli, which allows users to be free from any physical constraints.
In our demonstration, a user can recognize the shapes and textures of remote objects by using a master-slave system. This system consists of a handheld haptic interface at a local site and a camera platform at a remote site. The user holds the interface. The platform, which is equipped with a stereo camera and a laser range finder (LRF), rotates the LRF to measure the distance of a remote object placed in front of the platform, according to the translational and rotational motion of the handheld interface. The interface gives a 1-DOF reaction force to the thumb of the user. Thus the user can feel the shape of the remote object by combining the information about the hand motion with the reaction force. Furthermore, the user can feel the texture of the object by amplifying the high frequency component of the time-series variation of the LRF data. See the video at https://www.dropbox.com/s/ovafw9luw9p0vy/VideoAhap.mp4?dl=0.