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EDITORIAL

Special issue on collaborative haptic audio-visual environments and systems

Xiaohu Guo[1] · B. Prabhakaran[1] · Abdulmotaleb El Saddik[2]

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Multimedia and Information technology are reaching limits in terms of what can be done in multimedia applications with only sight and sound. The next critical step is to bring the sense of "touch" over network connections, which is commonly known as Tele-haptics. Haptics, a term which was derived from the Greek verb "haptesthai" meaning "to touch", introduces the sense of touch and force into the human–computer interaction. Virtual environments (VE) are usually referred to as computer-generated 3D worlds wherein users can interact through various human–computer interfaces and experience the so-called "virtual world". Collaborative virtual environments (CVE) are VEs that, in addition to the virtual experience, provide the ability for users to collaborate, such as co-manipulation of shared objects and tele-mentoring.

A special case of a CVE is the Collaborative haptic audio-visual environment (C-HAVE) where, in addition to traditional multimedia such as image, audio, and video, this new haptic media plays an important role. C-HAVEs allow multiple users, each with his/her haptic device, to collaboratively manipulate shared objects in a virtual environment. The potential of such technology is quite significant for many applications such as tele-presence, tele-learning, tele-medicine, tele-operation in hazardous environments, industrial design and testing, gaming, and interactive virtual reality.

✉ Xiaohu Guo
xguo@utdallas.edu

[1] Department of Computer Science, The University of Texas at Dallas, Richardson, TX, USA

[2] School of Electrical Engineering and Computer Science, University of Ottawa, Ottawa, Ontario, Canada

This special issue includes both papers of direct submission to the call for papers and extension of papers presented at 2014 IEEE International Symposium on Haptic Audio-Visual Environments and Games (HAVE). The extended conference papers have at least 30 % more materials through additional technical contributions, results and analysis.

In the first paper, M. Shamim Hossain, Sandro Hardy, Atif Alamri, Abdulhameed Alelaiwi1, Verena Hardy, and Christoph Wilhelm present an augmented reality-based serious game framework that motivates the stroke patients' involvement in the rehabilitation exercise. The users interact with reactive objects having embedded vibration motors and activated when physical objects collide with virtual objects. Users can also see their own arm interacting with a virtual representation of the physical object within an AR environment of other objects. The suitability and utility of the proposed framework are evaluated with real stroke patients and compared against the performance of a healthy control group, thus facilitating occupational therapists in assessing a patients progress.

In the second paper, Jacopo Aleotti, Giorgio Micconi, and Stefano Caselli present a visuo-haptic augmented reality system for object manipulation and task learning from human demonstration. Users operate a 3-DOF haptic device which are not co-located with the environment of real objects. Virtual objects are simulated in a physically plausible manner and co-exist with real objects in AR space. Automatic model-based object recognition and registration are performed from 3D range data acquired by a moving laser scanner mounted on a robot arm. Several experiments have been performed to evaluate the augmented reality system in both single-user and collaborative tasks. The authors also investigated the potential of the system for programming robot manipulation tasks by demonstration.

In the third paper, Chengcheng Hao, Wenyi Wang, and Jiying Zhao present an automatic video matting algorithm to generate high-quality alpha maps. Compared with conventional matting methods where trimap is needed to be manually specified, in this paper a self-adaptive trimap can be automatically generated for one frame and be propagated to the adjacent frames, using optical flow and thin plate splines interpolation. The auto-generated trimap can adaptively narrow its unknown region at sharp edges while expanding its unknown region at soft and fuzzy boundaries. The experimental results show that it can not only reduce the user intervention, but also improve the quality of alpha map.

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