VETG Chair’s Column

Jennifer Riley

Greetings VETG members! It is with great pleasure that we present the first VETG newsletter for the year. My sincere apologies for being late in the year on this, but we are still in search of a Newsletter Editor, and getting things back on track for our technical group. Thanks go to Hari Thiruvengada for his help in putting this first update together.

As you all know, we have had a change in officers for the VETG. I’m pleased to serve as this year’s Chair. I look forward to getting to know more people within the technical group and interacting with you as we work to improve the VETG. Hari Thiruvengada is our Program Chair. Hari worked to put together a nice lecture session for us for the 2011 annual meeting. Though we had a low number of submissions this year, the papers that were included should be of interest to our members. Tony Costello is our new Webmaster. We hope to get some much-needed updating done on our webpage very soon. We will be soliciting your ideas and articles for the web page and the newsletter in the near future.

Hari and I have had many discussion with regard to how to progress the VETG, engage members, and increase paper submissions. We appreciated the feedback of members that attended the annual technical group meeting in Las Vegas. Our goal is to increase the benefit of membership in the group.
VETG Chair’s Column (Cont.)

In order to address our immediate needs for leadership—Assistant Webmaster, Newsletter Editor, Program Chair Elect/Designate, Chair Elect/Designate, Secretary/Treasurer, and Communications Officer—we solicited nominations during the technical group meeting. We will provide information on the nominations and voting for these positions in the very near future.

There is much to do in order to promote the success of our technical group. I look forward to hearing your ideas and working with you.

VETG Program Chair’s Column

Hari Thiruvengada, VETG Program Chair

It gives me great pleasure to announce that the annual Virtual Environments Technical Group (VETG) technical session at the 55th Annual Meeting of the Human Factors and Ergonomics Society was a great success and well attended. The VETG session will took place on Tuesday, Sep 20, 2011 from 1:30—3 PM. In particular, I would like to thank our VETG president Jennifer Riley for volunteering to chair the session.

I was immensely delighted by the enthusiasm shown by each and every one of you in sharing your quality research ideas with fellow peers. Overall, we had 7 lecture papers and 4 posters submitted for review. Although, each submission represents great quality work and topic areas that are of key interest to our community, we were restricted by the number of sessions this year. I would like to thank you all for considering the VETG forum for your submissions. I encourage you to continue to submit your work to our great forum. I would also like to take this opportunity to thank all the reviewers for dedicating their attention and support in providing excellent reviews on time. My congratulations go to the authors of all accepted papers!

Thanks also go to the HFES staff, Technical Program Chair, Cheryl Bolstad, and fellow TG Program Chairs for keeping the review process flowing so seamlessly. I commend you all for the support you have shown in the past and encourage you to attend future sessions and show your support for our community. Remember, you are the voice of our community! We look forward to your support in the future and welcome any ideas to improve our Technical Group. See you all at our conference and in the meantime I encourage you to become members of our LinkedIn subgroup (http://www.linkedin.com/groups?gid=2131850&trk=myg_ugrp_ovr) and continue to share your thoughts and discussions online.
Annual Technical Group Meeting / Networking Reception

The annual Virtual Environments Technical Group meeting was held on Wednesday, September 21, 2011 at the annual HFES meeting. A networking reception was held to welcome members and to encourage the exchange of ideas and knowledge of work being conducted in virtual environments. The meeting included discussion the current state of the VETG and plans for the remainder of 2011 and activities for 2012. Twenty-four members were in attendance. A number of “new business” items were discussed, including nominations for officer positions, a VETG student paper or meeting attendance award, use of LinkedIn and the VETG email distribution list, and ideas for increasing the number of paper / poster submissions to the VETG.

Haptic Simulation Design for Motor Rehabilitation and Fine Motor Skill

David Kaber, Guk-Ho Gil & Michael Clamman

We are conducting research at North Carolina State University to advance the state-of-the-art of virtual reality (VR)-based haptic simulation for motor rehabilitation and skill training applications. In collaboration with Duke University and the Durham Veterans Administration Medical Center (VAMC), our team is designing and prototyping custom visual and haptic interfaces to be used in a series of motor therapy experiments with persons seeking recovery from minor traumatic brain injury (mTBI) with motor control implications.

As a first step in a four-year project sponsored by the National Science Foundation (NSF; Grant No. IIS-0905505), we tested and trained healthy subject motor control in native and VR forms of standardized psychomotor tasks in order to identify VR design features that might serve to accelerate motor learning and to make preliminary observations on the degree of skill development that can be achieved with a VR-based haptic simulation. The software and hardware used in the experiment included custom VR simulations of a complex figure reproduction test (the Rey-Osterreith Complex Figure (ROCF)) and a Block Design (BD) reconstruction subtest based on the Wechsler Abbreviated Scale for Intelligence (WASI). The BD subtest was used for training subject motor control with the non-dominant hand. A slightly different version of the BD test (from the Wechsler Adult Intelligence Scale, 3rd edn.) was used along with the ROCF and another commercially available standardized psychomotor test, the Matrix Reasoning (MR) subtest from the WASI, to assess subject motor skills pre- and post-training.

A sample of 24 right-handed students performed baseline testing with their left hands (including two ROCF reproductions, 14 block pattern reconstructions involving four or nine blocks, and the MR test). Each subject subsequently received 3 hours of motor skill training in the BD task across three days (see Figure 1), six trials of 14 patterns on each day.
For the training phase, subjects were divided into three groups, including persons assigned to the native or physical form of the task, a Basic VR condition providing a highly realistic visual representation of the actual BD task along with a haptic control interface (Sensible Phantom controller) for virtual block manipulation, or an Augmented VR condition including visual and haptic aiding. Visual aids included highlighting of the correct location for placement of a virtual block in a pattern based on its current orientation in the virtual task workspace as well as a visual reference showing how a block should be oriented for placement in a pattern (see Figure 2). The haptic aiding included a strong resistive force against subject placement of blocks in incorrect locations in a pattern (based on block orientation) and strong attractive forces in the case of correct block rotation. All test conditions followed the instructions of the original psychomotor tests. In a post-training session, subjects were retested using the ROCF, BD and MR tests to identify any changes from their baseline performance.

We hypothesized that subject post-training scores would improve as a result of therapy in the native form of the task or with the haptic control interface. Furthermore, we expected that Augmented VR training would lead to the greatest improvement, as compared to the native form of the BD task and Basic VR, due to the haptic enhancements (resistive and attractive forces) for block manipulation and pattern reconstruction. In support of this hypothesis, we found ROCF test performance to significantly improve for the Augmented VR condition group only with insignificant findings for the native task and Basic VR. However, the native form of the BD test did produce the shortest pattern completion times during the training sessions, as compared to the Basic and Augmented VR conditions. This is partly due to the use of the haptic device instead of grasping the blocks directly. There were no significant improvements in post-training BD and MR test performance as a result of the three therapy conditions.
Haptic Simulation… (Cont.)

These results provide support for using high-fidelity VR-based haptic simulations of standardized psychomotor tests for motor skill training, including visual and haptic enhancements for effective pattern recognition and discrete movement of objects. The results also provide insight for design of future haptic VR features. We are currently prototyping and usability testing methods of control-gain adaptation in the VR simulation, presentation of translucent objects to allow for quick shape recognition, auditory cues associated with motor behaviors, etc. A second experimental study has been planned, including healthy subjects and VAMC patients recovering from mTBI. Functional magnetic resonance imaging is to be used to measure brain blood flow in regions responsible for motor control and planning and a subtractive methodology will be used to compare scans conducted during psychomotor test performance pre- and post-training to assess the effect of VR exposure on neurophysiological and motor behavior changes.

On the Calendar

**HFES Feature Event Notices**
- IEA 2012—The 18th World Congress on Ergonomics, February 12-16, 2012 Racife, Brazil.

**Other Meetings**

The VETG needs you!

The VETG needs your stories and newsletter ideas. To submit information for the next VETG Newsletter or the webpage, please contact Jennifer Riley (jennifer@satechnologies.com).

VETG LinkedIn Subgroup: [http://www.linkedin.com/groups?gid=2131850&trk=my_g_ugrp_ovt](http://www.linkedin.com/groups?gid=2131850&trk=my_g_ugrp_ovt)