

Dr. Creem-Regehr is a professor in the cognition and neural sciences area of the department of psychology. Her research is focused in the areas of spatial cognition, embodied cognition, and perception and action. In other words, she studies humans' perception and understanding of their spatial environments and how this is influenced by their own capabilities and actions. Her approach relies on multiple methodologies in cognition and neuroscience as well as interdisciplinary collaboration. She directs the *Visual Perception and Spatial Cognition Laboratory* along with faculty colleagues Dr. Jeanine Stefanucci (Psychology) and Dr. William Thompson (School of Computing).

<http://www.cs.utah.edu/research/groups/percept/index.html>

### **Funding**

Over the past year, Dr. Creem-Regehr has accomplished research supported by four ongoing extramural grants. Two of these grants (with Stefanucci and Thompson), funded by the National Science Foundation, involve perception in virtual environments. The goal of these projects is to assess and improve how people perceive virtual spaces through the study of action affordances and the implementation of self-avatars—digital representations of humans. One project this year has established that the Kinect, a low-cost gesture tracking system, can be used to drive a virtual avatar hand to improve manipulation with a virtual object. (see *Raj, M., Creem-Regehr, S. H., Rand, K. M., Stefanucci, J. K., & Thompson, W. B. (2012). Kinect based 3D object manipulation on a desktop display. In Proceedings of the 9<sup>th</sup> SIGGRAPH Symposium on Applied Perception.*). Other work published this year compared distance perception across real and virtual environments (see *Geuss, M., Stefanucci, J. K., Creem-Regehr, S. H., & Thompson, W. B. (2012). Effect of viewing plane on perceived distances in real and virtual environments. Journal of Experimental Psychology: Human Perception and Performance, 38(5), 1242-1253*) and showed the ability of humans to adapt to new ways of interacting with a virtual environment (see *Kunz, B. R., Creem-Regehr, S. H., & Thompson, W. B. (2013). Does perceptual-motor calibration generalize across two forms of locomotion? Investigations of walking and wheelchairs. PLoS One. 8(2): e54446. doi:10.1371/journal.pone.0054446*).

A third grant (with Thompson), funded by the National Institutes of Health--National Eye Institute, involves the study of "visual accessibility"—how do individuals with severe visual impairments perceive and navigate through their environments? A publication this year assessed the importance of visibility of object-ground contact on accuracy of judgments of distance and size (see *Rand, K. M., Tarampi, M. R., Creem-Regehr, S. H. & Thompson, W. B. (2012). The influence of object ground contact on perception of distance and size under severely degraded vision. Seeing and Perceiving, 5(5), 425-447*).

### **Awards**

Most recently, Dr. Creem-Regehr was awarded a new large interdisciplinary multi-institution grant from the National Science Foundation, along with University of Utah *School of Computing and Scientific Computing and Imaging Institute* colleagues, Dr. Ross Whitaker, Dr. William Thompson, Dr. Mike Kirby, and Dr. Miriah Meyer. The three other institutions involved—University of California Santa Barbara, Texas A & M University, and Clemson University—include both psychologists and computer scientists working collaboratively on the project. The

project, *CGV: Large: Collaborative Research: Modeling, Display, and Understanding Uncertainty in Simulations for Policy Decision Making*, is a new direction for Dr. Creem-Regehr and her colleagues. It aims to establish the foundations for capturing and conveying the uncertainty associated with predictive simulations, so that future tools for visualizing these predictions will accurately and effectively present information about their uncertainty to a wide range of users. Three demonstration applications are closely integrated into the research plan: one in air quality management, a second in wildfire hazard management, and a third in hurricane evacuation management. Scientific contributions are expected in the areas of simulation and uncertainty quantification, visualization, perception and cognition, and decision making in the presence of uncertainty.

Dr. Creem-Regehr was also awarded a *Research Instrumentation Fund Award* this year from the University of Utah Office of the Vice President for Research to support her collaborative work on perception and action in virtual environments. The funding allowed for the purchase of a new *head-mounted-display* and *data gloves* to support the group's work involving the display and motion tracking of *avatars* within immersive virtual worlds. The equipment will facilitate work in embodied perception, focused on understanding the role of perceiving one's own body for both basic and applied research goals.

## **2012-2013 Publications**

\*student authors

Geuss, M.\*, Stefanucci, J. K., Creem-Regehr, S. H., & Thompson, W. B. (2012). Effect of viewing plane on perceived distances in real and virtual environments. *Journal of Experimental Psychology: Human Perception and Performance*, 38(5), 1242-1253.

Kesner, R. & Creem-Regehr, S. H. (2012). Parietal contributions to spatial cognition. In D. Waller and L. Nadel (Eds.). *Handbook of Spatial Cognition*. Washington DC: APA.

Raj, M.\*, Creem-Regehr, S. H., Rand, K. M.\*, Stefanucci, J. K., & Thompson, W. B. (2012). Kinect based 3D object manipulation on a desktop display. In *Proceedings of the 9<sup>th</sup> SIGGRAPH Symposium on Applied Perception*.

Stefanucci, J. K., Lessard, D.\*, Geuss, M.\*, Creem-Regehr, S. H., & Thompson, W. B. (2012). Evaluating the accuracy of size perception in real and virtual environments. In *Proceedings of the 9<sup>th</sup> SIGGRAPH Symposium on Applied Perception*.

Rand, K. M.\*, Tarampi, M. R.\*, Creem-Regehr, S. H. & Thompson, W. B. (2012). The influence of object ground contact on perception of distance and size under severely degraded vision. *Seeing and Perceiving*, 5(5), 425-447.

Ziemek, T.\*, Creem-Regehr, S.H., Thompson, W.B. & Whitaker, R. (2012). Evaluating the effectiveness of orientation indicators with an awareness of individual differences. *ACM Transactions on Applied Perception*, 9(2):7:1-7:23.

Johnson, C. L., Semple, I. L.\*, Creem-Regehr, S. H. (2013). The effects of scaling cues and interactivity on a viewer's ability to estimate the size of features. *Journal of Geoscience Education*, 61, 68–80.

Kunz, B. R.\*, Creem-Regehr, S. H., & Thompson, W. B. (2013). Does perceptual-motor calibration generalize across two forms of locomotion? Investigations of walking and wheelchairs. *PLoS One*. 8(2): e54446. doi:10.1371/journal.pone.0054446