Stretching Space: Exploiting Change Blindness for Redirected Walking
2010-present

Virtual reality training systems do not allow users to walk through large areas due to size limitations in the physical space. Change blindness redirection is a novel technique for enabling real walking through an immersive virtual environment that is considerably larger than the available physical workspace by subtly manipulating the environment structure behind the user's back. This approach improves on previous redirection techniques, as it does not introduce any visual-vestibular conflicts from manipulating the mapping between physical and virtual motions, nor does it require breaking presence to stop and explicitly reorient the user. We conducted two user studies to evaluate the effectiveness of the change blindness illusion when exploring a virtual office building that was an order of magnitude larger than the physical walking space. Only one out of 77 participants across both studies definitively noticed that a scene change had occurred, suggesting that change blindness redirection provides a remarkably compelling illusion. Perhaps more significant is that despite the dynamically changing environment, participants were able to draw coherent sketch maps of the environment structure, and pointing task results indicated that they were able to maintain their spatial orientation within the virtual world.

In the above scenario, users explore an Afghan village encompassing over 3,000 square feet of virtual space. The blue rectangle indicates the dimensions of the physical walking space. As the user searches through each building in the village for a stash of hidden weapons, we apply manipulations to the environment structure behind his back, allowing him to walk through the entire virtual environments while staying within the boundaries of the physical walking space. This provides the effect of sliding the tracking space left and right, providing a virtual corridor (the red dashed rectangle) that is nearly limitless.

References
E. Suma, S. Clark, S. Finkelstein, and Z. Wartell, "Exploiting Change Blindness to Expand Walkable Space in a Virtual Environment," IEEE Virtual Reality 2010, pp. 305-306.

External Collaborators: Mary Whitton (UNC)

In the News: Huffington Post science reporter Cara Santa Maria visited ICT's Mixed Reality Lab for her "Talk Nerdy to Me" video series.

Project Leaders: Mark Bolas, Evan Suma

At the University of Southern California Institute for Creative Technologies leaders in artificial intelligence, graphics, virtual reality and narrative advance low-cost immersive techniques and technologies to solve problems facing service members, students and society.