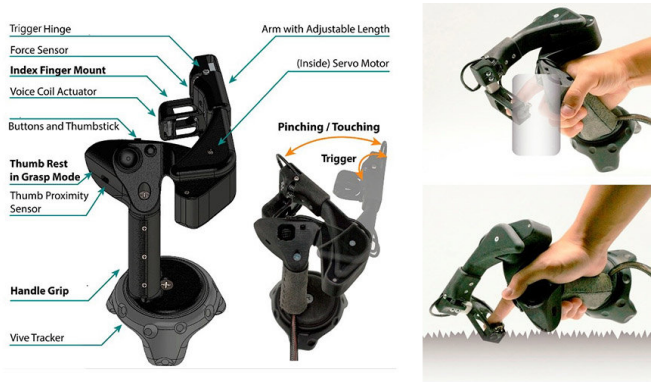
Canetroller for visually impaired is designed for exploring virtual worlds

14 March 2018, by Nancy Owano



(Left) The CLAW's configuration and components. (Right) The CLAW as it grabs a virtual object, and touches a virtual surface. Credit: Microsoft Research

Oh the wonder of it all. Virtual reality is opening us up to experiences that set our imaginations and curiosity on fire to explore the unknown, the untried, in full motion.

Beyond headsets and controllers and screens, the fundamental enabler is our eyes, as we step down, leap up, walk through new worlds. But wait. What if you are visually impaired?

Assumption: Virtual reality is unexplorable, so forget about it. Unless—can VR be experienced by vision-impaired people?

Microsoft Research looked for answers, working on a system whereby exploring and understanding unfamiliar virtual spaces could be made possible for the visually impaired.

"Working with interns Yuhang Zhao from Cornell University and Cindy Bennett from the University of Washington, said the Microsoft Research blog, "Microsoft Research developed the Canetroller prototype to enable people who are skilled white cane users in the real world to transfer their navigation abilities into virtual settings."

Their haptic controller simulates the interaction of a white cane as the blind person attempts to navigate a virtual space using their already existing orientation and mobility skills.

The team's approach actually involves both a haptic and auditory cane simulation.

When the virtual cane hits on a virtual object, the brake stops the controller from moving. The voice coil kicks in, to generate a vibration simulating the high frequency vibration when a cane hits a real object. A 3-D spatial sound is also provided. The controller is paired with an HTC Vive headset for tracking head position and delivering 3-D spatial audio through headphones.

The voice coil can also simulate ground texture when the cane is sweeping the ground.

All in all, there are five parts to this system: 1. braking mechanism anchored on the waist 2. The hand-held cane controller 3. slider connecting the brake and controller 4. voice coil mounted on the trip of the cane controller to generate vibrotactile sensations and 5. HTC Vive tracker on the controller to track the controller's movement.

How well does their system work? They conducted a "usability" study.

Participants were asked to experience a room with four walls, carpet, door, table, and trashcan. Eight out of nine participants could understand the layout and could locate the position of all virtual objects by using the cane controller—after a few minutes of practice.

The outdoor test involved a sidewalk, curb with tactile domes, traffic light and street with cars passing. Participants could identify the objects,

understand the flow of traffic, and were able to cross the street based on an audio signal from the traffic light.

The researchers mention a practical application of benefit, supporting orientation and mobility training. "The Canetroller enables novel scenarios such as new types of Orientation and Mobility training in which people can practice white cane navigation skills virtually in specific settings before travelling to a real-world location," said the Microsoft Research blog.

From a general technology perspective, the standout characteristic about their work lies in improved haptics. The dream is always having users experience the virtual world more naturally. That includes enabling users' finger and hands to have dynamic haptic feedback.

"The Microsoft Research team – Mike Sinclair, Christian Holz, Eyal Ofek, Hrvoje Benko, Ed Cutrell, and Meredith Ringel Morris – have been exploring ways existing technology can generate a wide range of haptic sensations that can fit within hand-held VR controllers, similar in look and feel to those currently used by consumers."

Christian Holz said, "What you really want is the impression of virtual shapes when you interact with objects in VR, not just the binary feedback you get from current devices."

More information: Touching the Virtual: How Microsoft Research is Making Virtual Reality Tangible, www.microsoft.com/en-us/resear … al-reality-tangible/

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