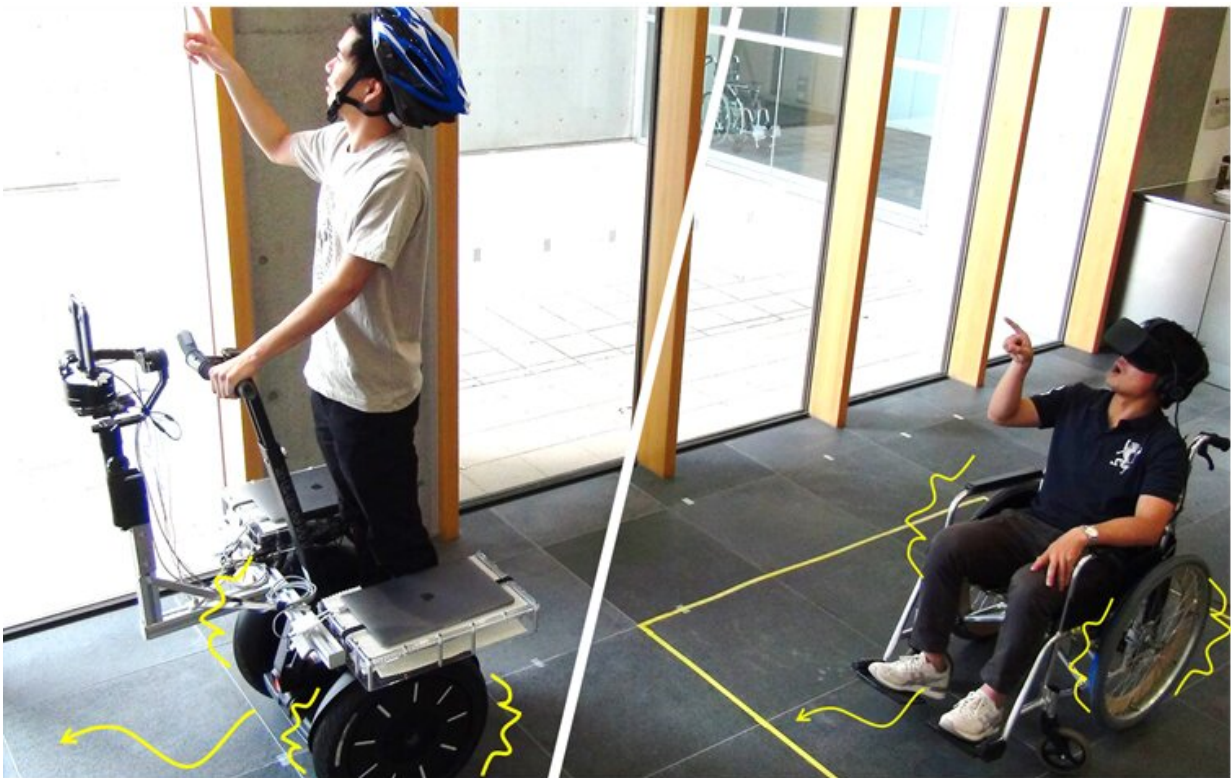# New VR system lets you share sights on the move without causing VR sickness

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A modified wheelchair unit recreates the acceleration of a Segway for a remote user, reducing VR sickness. Credit: Tokyo Metropolitan University

Researchers from Tokyo Metropolitan University have engineered a virtual reality (VR) remote collaboration system which lets users on Segways share not only what they see but also the feeling of acceleration

as they move. Riders equipped with cameras and accelerometers can feedback their sensations to a remote user on a modified wheelchair wearing a VR headset. User surveys showed significant reduction in VR sickness, promising a better experience for remote collaboration activities.

Virtual reality (VR) technology is making rapid headway, letting users experience and share an immersive, 3D environment. In the field of remote work, one of the major advances it offers is a chance for workers in different locations to share what they see and hear in real-time.

An example is users on personal mobility devices in large warehouse facilities, factories, and construction sites. Riders can cover large areas with ease while highlighting issues in real-time to a remote co-worker. However, one major drawback can ruin the whole experience: VR sickness. VR sickness is a type of motion sickness which comes from users seeing "motion" through their headsets without actually moving. Symptoms include headaches, nausea, and sometimes vomiting. The problem is particularly acute for the example above, when the person sharing the experience is moving about.

To get around this issue, researchers from Tokyo Metropolitan University led by Assistant Professor Vibol Yem have created a system which lets users share not only what they see, but the sensation of movement as well. They focused on Segways as a common, widely available personal mobility vehicle, mounting two 3D cameras and a set of accelerometers to measure not only visual cues but detailed information on the acceleration of the vehicle. This was fed back via the internet to a remote user wearing a VR headset on a modified wheelchair, with separate motors attached to the wheels.

As the user on the Segway accelerated, so did the wheelchair, allowing remote users to not only see the same scenery, but feel the same

acceleration. Of course, the wheelchair wasn't allowed to move the same distances as the Segway; it was gently returned to its original position when the Segway was not accelerating.

The team put their device to the test by asking volunteers to become remote users and rate their experience. There was a reduction in VR sickness of 54% when the sensations of movement were added, with excellent ratings for the user experience. They also noticed subtleties in how the information should be fed back. For example, users found it best when around 60% of the acceleration suggested by the visual cues was fed back to the wheels, largely due to the sensitivity of the vestibular system (how we sense balance, orientation and motion) compared to our vision.

Though improvements are still needed, the team's system promises exciting new possibilities for remote collaboration, freeing remote users from a major drawback of VR technology. The study is published in *Advanced Robotics*.

Provided by Tokyo Metropolitan University

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