

## 'Substitutional reality' system plays head games to explore delusions (w/ Video)

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Substitutional Reality System. In the recording module (left), the panoramic view was recorded in advance by a panoramic camera, and stored in the data storage connected to the control computer. In the experience module (right), either a live scene captured by a head-mounted camera or recorded scenes cropped from a pre-recorded movie were shown on a head-mounted display (HMD). The cropped area presented in the recorded scenes was determined in real-time using head orientation information calculated from the HMD orientation sensor. Scene examples are shown here. In the recorded scene a person with a lab coat waved his hand, who was not present in the live scene. A participant believed the person with the lab coat was physically present there, when the covert switch from the live to the recorded scene was successfully performed. Image (c) Scientific Reports 2, Article number: 459 doi:10.1038/srep00459

(Phys.org)—Take a commercially available panoramic video camera used for recording, add a computer for storing recorded footage, and a head-mounted visual display that can switch seamlessly between the footage and a live feed captured by a camera and attached microphone.



The result of all this is what Japanese researchers are using in their explorations of "substitutional reality," or SR. This is a purposeful new direction from virtual reality. The SR system delivers a "conviction" of being in the real world, which is absent in VR technologies.

The researchers discuss their work, tests, and implications in a paper titled "Substitutional Reality System: A Novel <u>Experimental Platform</u> for Experiencing Alternative Reality," published by *Scientific Reports*.

Keisuke Suzuki, who is at the Sackler Centre for Consciousness Science at the University of Sussex and lead author, said that he and his research team from RIKEN in Japan came up with their SR system in order to explore cognitive mechanisms underlying people's convictions about reality. How can you trust what you perceive is real? The answer can be in an experimental platform that presents scenes that participants believe are completely real, but are really the result of content that is manipulated. A video shows how the researchers had their helmeted study participant looking at live scenes switched to past recorded scenes, presented alternately. The SR system was essentially manipulating the person's sense of reality by showing live scenes and recorded scenes (edited in advance) with the goal being to witness if, and to what extent, a participant fails to recognize there is a reality gap. Most of the subjects failed to distinguish between the live and recorded scenes in the experiment. "Seven of 10 participants could not detect that the given scene was recorded...The participant was not certain whether he was experiencing live or recorded scenes."

The researchers who developed the system along with Suzuki are with the RIKEN Brain Science Institute's Laboratory for Adaptive Intelligence. They are Sohei Wakisaka and Naotaka Fujii. The Brain Science Institute was established in 1997 as part of RIKEN, which is an independent research institution supported by the Japanese government.



Of what use is the SR system and their research? The system is explained as of use to study cognitive dysfunction in psychiatric patients. People without such disorders can distinguish between real and imagined events using unconscious processes, but the processes break down in some psychiatric conditions. Schizophrenics may hear voices and see what is not there; some delusional patients suffer from perpetual false memories.

In wearing an "Inception" helmet, reality is manipulated to simulate experiences, and could be used to study cognitive dysfunction in psychiatric disorders.

"SR provides a unique opportunity to model these experiences in healthy subjects, which could be useful for investigating the <u>cognitive</u> <u>mechanisms</u> underlying hallucinations and delusions," said Suzuki. The system may also offer an affordable way for scientists to explore these disorders.

**More information:** Substitutional Reality System: A Novel Experimental Platform for Experiencing Alternative Reality, *Scientific Reports* 2, Article number: 459 <u>doi:10.1038/srep00459</u>

## Abstract

We have developed a novel experimental platform, referred to as a substitutional reality (SR) system, for studying the conviction of the perception of live reality and related metacognitive functions. The SR system was designed to manipulate people's reality by allowing them to experience live scenes (in which they were physically present) and recorded scenes (which were recorded and edited in advance) in an alternating manner without noticing a reality gap. All of the naïve participants (n = 21) successfully believed that they had experienced live scenes when recorded scenes had been presented. Additional psychophysical experiments suggest the depth of visual objects does not



affect the perceptual discriminability between scenes, and the scene switch during head movement enhance substitutional performance. The SR system, with its reality manipulation, is a novel and affordable method for studying metacognitive functions and psychiatric disorders.

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