Using virtual reality to catch a real ball

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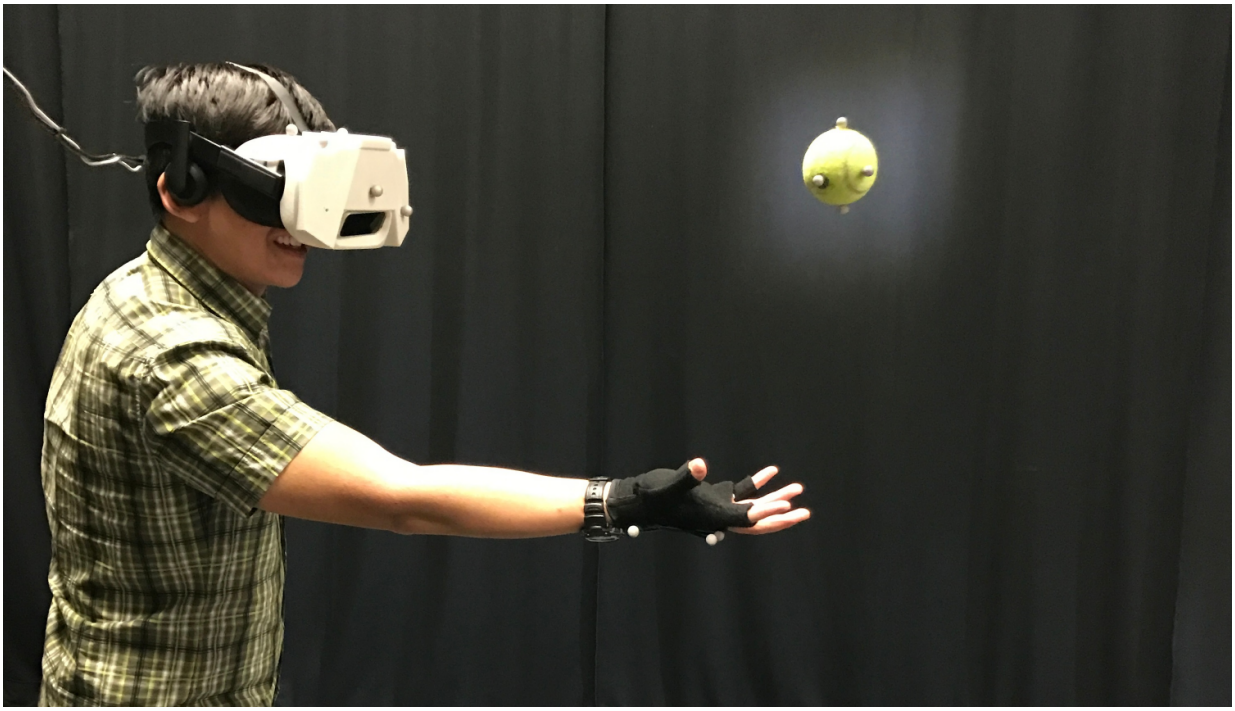

Credit: Disney Research

Disney Research scientists have found innovative ways to enhance virtual experiences involving interactions with physical objects by showing how a person using a virtual reality system can use it to reliably catch a real ball.

"Catching and feeling the real ball in your hand makes VR much richer, more believable, more exciting, more interactive, more dynamic, more

real," said Günter Niemeyer, senior research scientist.

Catching a ball requires many coordinated skills learned from early childhood, including strong hand-eye coordination. Niemeyer and Matthew Pan, a Disney Research lab associate and a Ph.D. student at the University of British Columbia, showed that this tight coordination is possible in virtual reality (VR) and that users are able to catch real flying balls.

Different styles of visualization may also lead to different behaviors and can even make catching easier, they found.

Niemeyer and Pan will present their work at the IEEE Virtual Reality 2017 conference in Los Angeles March 18-22.

"As virtual reality systems become increasingly common, the idea that the user experience can be enriched by enabling dynamic interaction with real objects is gaining interest," said Markus Gross, vice president for research at Disney Research. "This early work by our team is tantalizing and suggests that bridging the virtual and real worlds is not only possible, but offers many new opportunities and benefits."

Niemeyer and Pan demonstrated the use of VR to catch a real ball by using a motion capture system to track the motion of the ball as well as the location of the catcher's hands and head. The scene is then virtually rendered and viewed through a head-mounted display.

Several visualization options were studied: one similar to the real-world experience in which only the ball's position is rendered and two other options that either showed the predicted trajectory of the ball or simply showed a target area where a catch could be made.

Users had success catching the ball in all three visualizations, Pan said.

When only the ball position was rendered, users caught 95 percent of the balls tossed underhanded to them. Catching was equally successful in the other modes, though the catching strategy changed when only the target location was identified. In those cases, the catcher's hands reach the catch location much earlier prior to the catch.

"The most apparent explanation is that, without information about the ball's location, the catcher must rely on the identified target point, changing the task from one requiring higher brain functions to estimate trajectory to a simpler, visually guided pointing task," Pan said.

The ability of the system to predict the flight of a real ball and visualize it for the user gives the catcher an advantage not available in the real world, he noted.

"With VR, we can show you the future by pre-rendering where the ball is going to be," Niemeyer said. "For some types of interactions, game designers might choose to take advantage of VR to make certain tasks easier, just as using a net to catch balls might make some games more enjoyable."

Combining creativity and innovation, this research continues Disney's rich legacy of leveraging technology to enhance the tools and systems of tomorrow.

More information: "Catching a Real Ball in Virtual Reality-Paper" [PDF, 284.32 KB]

Provided by Disney Research

https://phys.org/news/2017-03-virtual-reality-real-ball.html