Medical Xpress

Augmented reality glasses may help people with low vision better navigate their environment

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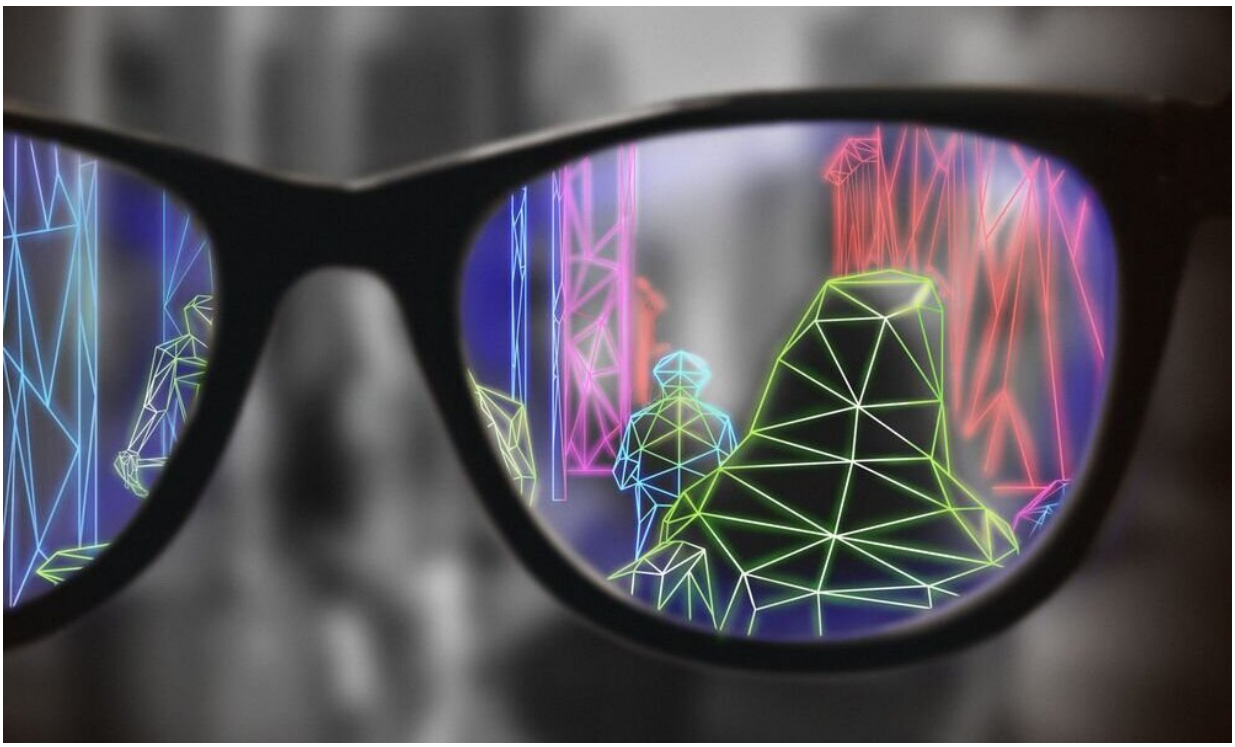

Graphic representation of what a patient sees when wearing an augmented reality low vision aid. Credit: Scott Song for USC Roski Eye Institute

Nearly one in 30 Americans over the age of 40 experience low vision—significant visual impairment that can't be corrected with

glasses, contact lenses, medication or surgery.

In a new study of patients with retinitis pigmentosa, an inherited degenerative eye disease that results in poor vision, Keck School of Medicine of USC researchers found that adapted augmented reality (AR) glasses can improve patients' mobility by 50% and grasp performance by 70%.

"Current wearable low vision technologies using virtual reality are limited and can be difficult to use or require patients to undergo extensive training," said Mark Humayun, MD, Ph.D., director of the USC Dr. Allen and Charlotte Ginsburg Institute for Biomedical Therapeutics, codirector of the USC Roski Eye Institute and University Professor of Ophthalmology at the Keck School.

"Using a different approach—employing assistive technology to enhance, not replace, natural senses—our team adapted AR glasses that project bright colors onto patients' retinas, corresponding to nearby obstacles," Humayun said.

Patients with retinitis pigmentosa wore adapted AR glasses as they navigated through an obstacle course based on a U.S. Food and Drug Administration-validated functional test. Using video of each test, researchers recorded the number of times patients collided with obstacles, as well as the time taken to complete the course. Patients averaged 50% fewer collisions with the adapted AR glasses.

Patients also were asked to grasp a wooden peg against a black background—located behind four other wooden pegs—without touching the front items. Patients demonstrated a 70% increase in grasp performance with the AR glasses.

"Patients with retinitis pigmentosa have decreased peripheral vision and

trouble seeing in low light, which makes it difficult to identify obstacles and grasp objects. They often require mobility aids to navigate, especially in dark environments," said Anastasios N. Angelopoulos, study project lead in Humayun's research laboratory at the Keck School.

"Through the use of AR, we aim to improve the quality of life for low vision patients by increasing their confidence in performing basic tasks, ultimately allowing them to live more independent lives," Angelopoulos says.

How the AR system works

The AR system overlays objects within a 6-foot wireframe with four bright, distinct colors. In doing so, the glasses provide visual color cues that help people with constricted peripheral vision interpret complex environments, such as avoiding obstacles in dimly lit environments.

To accomplish this, researchers used a process called simultaneous location and mapping, allowing the AR glasses to fully render the 3-D structure of a room in real time. The glasses then translated this information into a semitransparent colored visual overlay, which highlighted potential obstacles with bright colors to help patients with spatial understanding and depth perception. This technology can work on commercially available devices.

According to Humayun, while major cost and technical issues remain, this type of assistive technology could eventually become more practical for everyday use in the near future.

More information: Anastasios Nikolas Angelopoulos et al, Enhanced Depth Navigation Through Augmented Reality Depth Mapping in Patients with Low Vision, *Scientific Reports* (2019). DOI: 10.1038/s41598-019-47397-w

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