Visionize uses virtual reality headsets to help people with low vision

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To get through a day's work at the office, Kenyetta McCurdy-Byrd needs to pack an entire toolbox.

There's the bioptic telescope she attaches to her glasses to help her see long distances. There's the zoom text software she uses to read from a screen. There are the two hand-held magnifiers that enable her to read from paper. And there are three pairs of prescription glasses to help bring things into focus the rest of the time.

"Sometimes I joke that I have to carry a huge bag with all my gadgetry just to see," said the 42-year-old deputy director of a social service organization in Wilmington, Del.

But it's not so much a joke as it is reality for the estimated 4 million to 5 million Americans who, like McCurdy-Byrd, suffer from low vision, defined as a chronic, disabling visual impairment that can't be corrected with eyeglasses or surgery.

Sufferers of low vision, a symptom of macular degeneration, have long had to toggle between different gadgets to help them see under different conditions. It's not unusual for a person to have a literal toolbox containing various magnifiers and glasses.

But a solution to the toolbox could soon be on the way, thanks to Frank Werblin and a pair of virtual reality goggles.

Werblin, a professor of neuroscience at the University of California, Berkeley, is the brains behind Visionize, a piece of software designed to help sufferers of low vision that uses the kind of virtual reality headsets popular in video gaming.

The idea is relatively simple: Patients don the headset with a smartphone in it. The smartphone's camera takes real-time images from the patients' surroundings and magnifies them in front of their eyes. They can target the magnification and adjust its strength according to their needs.

"Traditional treatments use magnification, but they magnify everything," Werblin said. Most people with low vision experience blurriness only in the center of their eye, he said, and don't need the whole-eye magnification that existing treatments offer.

"If you wear a telescope, then you lose peripheral vision," he said. "So our challenge was to find a way for people to see the world in context, but to create a kind of telescope in the middle of that view."

The technology's adjustable nature means that a person could potentially ditch the toolbox and use only the headset.

Using head-mounted displays to treat low vision isn't new. In the 1990s, Robert Massof, a professor of ophthalmology and neuroscience at Johns Hopkins University School of Medicine, partnered with NASA and Polaroid Corp. to turn a head-mounted device that NASA engineers had originally intended for space use into a device that could help low-vision patients see.

Named the Low-Vision Enhancement System, or LVES (pronounced "Elvis"), the device magnified objects as much as 10 times and made images brighter. Users could adjust the magnification and contrast by turning knobs on the battery-powered belt pack, which weighed about a

pound and was attached to the headset via a cable.

It was far from an ideal solution, though. Aside from the weight and bulk of the device, it showed images only in black and white, had a limited view range and was sold to patients through low-vision centers for $5,000 ($8,500 in 2015 dollars).

Werblin wanted to develop a tool accessible for the wider low-vision community. Having spent many years working on retinal chips that can be implanted in eyeballs to help the blind see, he sought a solution that was less invasive and more affordable. Seeking advice from Massof, now 67 and still at Johns Hopkins, he began developing hardware.

He quickly realized that he and the virtual reality community were operating in parallel. The Samsungs and Oculuses of the world were designing the tools for gaming, but the increasingly powerful processors they were squeezing into smartphones and the improvement of VR headset comfort were exactly what Werblin needed. He saw an opportunity to repurpose the technology.

Massof was recently among the first to test Visionize with his low-vision patients. According to Massof, because the device uses Samsung's Gear headset and is powered by a smartphone, it has two key benefits.

First, it's more affordable than LVES ever could be because all the pieces of technology in the Visionize headset are developed for mass consumer adoption.

Second, because the virtual reality headset and smartphone markets are so competitive, developers are constantly improving the technology, which enables Visionize to take advantage of those advancements.

"The idea would be to piggyback off these tech developments that are

changing almost monthly," Massof said.

In its current form, the Visionize headset isn't quite the ideal solution either. While it's significantly lighter and more compact than LVES, it still suffers from the same problem all virtual reality headsets currently have.

"The device is clunky, a little heavy and awkward," said McCurdy-Byrd, who took part in Massof's trials with Visionize. "It reminded me of goggles."

Both Massof and Werblin also acknowledged that there are problems to be worked on, like dealing with the nausea that comes from using a VR headset (a problem the gaming community is also trying to solve), and training patients to use the headset.

But what they have so far works. The next step is to send patients home with the Visionize headset to see how they use it outside a lab environment.

"I just want to see," McCurdy-Byrd said. "So even if it's clunky, I'll wear it and hope that it gets smaller. In any case, it's definitely an ice breaker."