

Researchers develop camera for the blind

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Elizabeth Goldring with the camera she developed. Photo / Donna Coveney

(PhysOrg.com) -- Elizabeth Goldring smiles as she shows a visitor photos she's taken — and can see — with her blind eye.

The demonstration comes more than 20 years after Goldring, a senior fellow at MIT's Center for Advanced Visual Studies, and colleagues began work on a “seeing machine” that can allow some people who are blind or visually challenged to access the Internet, view the face of a friend and much more.

The team has moved from Goldring's inspiration, a large diagnostic device costing some \$100,000, to a \$4,000 desktop version, to the current seeing machine, which is portable and inexpensive. “We can make one for under \$500,” Goldring said.

Although the device can be connected to any visual source, such as a video camera or desktop computer, Goldring especially enjoys using it with a photo camera. “When someone has a diminished sense, the inability to express yourself with that sense can be frustrating,” she said. By taking photos, “I feel I’m able to express myself visually with my blind eye, and there’s value in that, I think.”

Further, “it’s light enough that I really want to take it with me when I go for a walk.” (Goldring, who is visually challenged, has enough sight in one eye to permit mobility.)

Goldring’s idea for the seeing machine began with a visit to her optometrist. At the time, she was completely blind.

To determine if she had any healthy retina left, technicians peered into her eyes with a scanning laser ophthalmoscope, or SLO. With the machine they projected a simple image directly onto the retina of one eye, past the hemorrhages within the eye that contributed to her blindness.

She was indeed able to see the test image. So she asked if they could write the word “sun.” “And I was amazed that I was able to read a word!” Goldring said.

She went on to use the device for other visual experiences. For example, video of her doctor was transmitted through the SLO, and for the first time she saw his face.

But although the SLO held promise for the broader blind public, it had serious drawbacks — including its prohibitive cost. Goldring determined to develop a more practical, accessible machine.

She began collaborating with people such as Rob Webb, the SLO’s inventor and a senior scientist at the Schepens Eye Research Institute,

Harvard University, and dozens of MIT students. Those involved in the current machine are Yifei Wu, an MIT senior who began the work as a freshman and has been instrumental in developing the seeing-machine camera; Brandon Taylor, a graduate student at the MIT Media Lab; and Quinn Smithwick, a postdoctoral associate in the same lab.

The portable device is relatively inexpensive in part because it replaces the laser of the SLO with light-emitting diodes (LEDs), another source of high-intensity light that is much cheaper.

Further, “everything in it is already mass-produced for other purposes,” said Taylor. He also noted that since the seeing-machine project began, “LCDs and other components have gotten much smaller and are readily available.”

The portable seeing machine is about five inches square and mounted on a flexible tripod that makes it easy to carry. A digital camera is attached to the top. The visual feed from the camera travels into the seeing machine to a Liquid Crystal Display (LCD) illuminated by LEDs. (This is the same kind of LCD common in cameras and TVs.)

The visual data is then focused into a single “point” that travels into the eye. “This is not magnification,” said Smithwick. “What makes this work is focusing the data into a tiny spot of light.”

What’s next? Goldring aims to show the new machine to other visually challenged people and looks forward to their feedback. Plans are underway to test it at the Low Vision Clinic at the Joslin Diabetes Center’s Beetham Eye Institute in Boston.

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Provided by MIT

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