

Researchers use light projector and single-pixel detectors to create 3-D images

May 17 2013, by Bob Yirka

(Phys.org) —Researchers from the University of Glasgow and the University of Cambridge have devised a unique method of capturing three-dimensional images. As described in a paper published in the journal *Science*, they used an ordinary light projector, four single-pixel photodetectors, an analog-to-digital converter, and a computer to capture 3-D images of a mannequin head.

The idea is based on the concept of ghost imaging where paired light sources, such as a split laser beam, are used to create 3-D images. Prior efforts have involved shooting a target with one part of the split beam, then capturing the reflected light with a photodetector. The other part of the beam is recorded by a traditional camera. In this new effort, the researchers took a much more pragmatic approach—they accomplished the same thing using simpler equipment.

To create the 3-D image, the researchers set up a light projector—the same kind used for viewing slides on a screen—with the light projected onto a mannequin head. Next, they placed a transparent screen capable of displaying light-blocking speckle patterns (generated by the computer) between the projector and the mannequin head. Light able to pass through the speckle pattern would eventually strike the mannequin and bounce off. Four single-pixel photodetectors were set up to capture the bounced light—one each above, below and to each side of the projector. The photodetectors were connected to an analog-to-digital converter which sent results to the computer. Once everything was in place, the researchers caused the computer to send different speckle

patterns to the screen while the photodetectors captured the reflected light. Each pass allowed the computer to capture more information. As the total number of speckle patterns reached a million, individual 2-D images emerged—each one based on data from a single [photodetector](#). Software on the [computer](#) then used the four 2-D [images](#) to create a single 3-D image.

How such a system might be used is still up for debate, as some issues still need to be worked out. The slow refresh rate, for example, means it takes half an hour to create one image. The researchers are confident they can refine the design, however, to speed up the process. Once that happens, they suggest, their imaging system might be useful for detecting gas fields, building medical systems or catching terrorists at airports.

Original [press release](#).

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