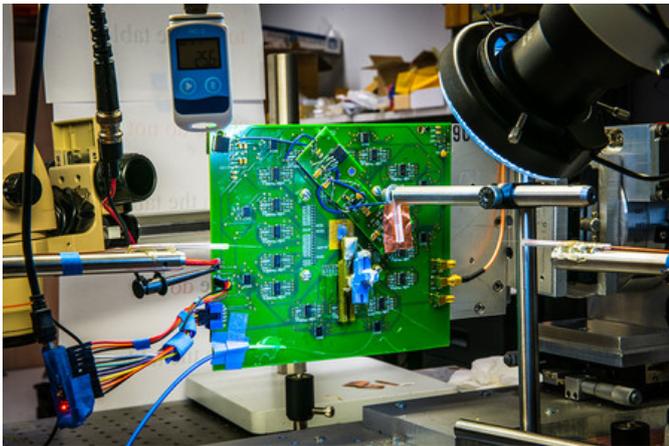


A "Lensless" Camera for Flat Phones?

Written by Marco Attard
23 June 2017

Caltech researchers claim to create a camera lacking one of the most basic components, the lens. Instead, the "lensless camera" uses what is dubbed an "ultra-thin optical phased array" (OPA).



According to the researchers, the OPA does what lenses do-- manipulate incoming light-- computationally instead of optically. Whereas lenses bend incoming light to focus it on a piece of film or an optical sensor, the OPA uses an array of light receivers to add a tightly controlled time delay (or phase shift) to the light. This allows the camera to selectively "look" in different directions, and focus on different objects.

The principle is actually similar to the way phased communication arrays focus and steer radio waves in a particular direction, only in reverse.

"With our new system, you can selectively look in a desired direction and at a very small part of the picture in front of you at any given time, by controlling the timing with femto-second-- quadrillionth of a second-- precision," professor Ali Hajimiri says. "We've created a single thin layer of integrated silicon photonics that emulates the lens and sensor of a digital camera, reducing the thickness and cost of digital cameras."

The OPA can even mimic the effects of different lenses, such as fish-eye or telephoto, through adjustments in the way the array receives light. It's still early days, mind-- so far, as a first step the team managed to create a 2D lensless camera array able to capture a low resolution image of a barcode. The future will see it build a larger version for higher resolution images.

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