Bell Labs improves lensless camera with additional pixel on sensor

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Reconstruction using measurements from two sensors. Credit: arXiv:1306.3946 [cs.IT]

(Phys.org) —A research team from Bell Labs that developed a lensless camera has now improved upon the design by adding a second pixel to the sensor used to read data coming through an aperture array. In their paper uploaded to the preprint server *arXiv*, the team describes how they added a second pixel to the sensor that reads incoming light from the aperture array. Doing so required additional programming of code on an associated computer to take advantage of the additional data provided by a slightly different view of the object being captured.

The camera is part of ongoing research by several groups into a technique known as optical sensing. Such devices consist of an aperture array that can be programmed to randomly allow light to pass through some of its cells, but not others. It sits between a light source and a single pixel sensor that picks up the light that passes through the array. To create an image, multiple shots are taken, each with a different random pattern created on the aperture array. The computer generates the multiple array patterns and uses the data from the sensor to create an image. In this new effort, the team added a second pixel to the tri-color sensor providing two new benefits.

The first benefit is that it allows for the creation of an image in half the time. Since data from both sensors is married via computer software into one image, rather than producing two images, twice as much data is sent during each snapshot.

The second benefit is that the addition of the second pixel allows for a higher quality image to be created. This is because the two pixels get a slightly different view of the light coming through the array, offering more data per individual shot.

As research continues with the new type of camera, it's not difficult to

see where the technology is going. Adding more pixels to the aperture array, increasing processing speed, and developing ever more sophisticated software will allow for the creation of higher resolution images in shorter amounts of time. At some point, (because the results are always in focus) it seems logical to conclude that such cameras will find a place in photography applications for still images of non-moving targets—all at a much reduced price.

More information: Multi-view in Lensless Compressive Imaging, arXiv:1306.3946 [cs.IT] arxiv.org/abs/1306.3946

Abstract

Multi-view images are acquired by a lensless compressive imaging architecture, which consists of an aperture assembly and multiple sensors. The aperture assembly consists of a two dimensional array of aperture elements whose transmittance can be individually controlled to implement a compressive sensing matrix. For each transmittance pattern of the aperture assembly, each of the sensors takes a measurement. The measurement vectors from the multiple sensors represent multi-view images of the same scene. We present theoretical framework for multi-view reconstruction and experimental results for enhancing quality of image using multi-view.

via Arxiv Blog

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