Ghost imaging of a multispectral temporal signal

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Exploitation of the statistical properties of classical or non classical light sources is the cause of fascinating new applications. For the two last decades, ghost imaging has emerged as a way to form images of an object with a Single Point Detector (SPD) that does not have spatial resolution [1-5]. By taking into account space-time duality in optics, the extension of the results of spatial ghost imaging to the time domain has been investigated [6]. However, the currently proposed solutions use SPD. This solution requires many realizations (several thousands) of the same temporal signal, limiting the current applications to the detection of synchronized and reproducible signals.

Here, we present a very simple device, inspired by computational ghost imaging [4], that allows the retrieval of a single non-reproducible, periodic or non-periodic, temporal signal. The reconstruction is performed by a single shot, spatially multiplexed, measurement of the spatial intensity correlations between a computer-generated random images and the images, modulated by a temporal signal, recorded and summed on a chip CMOS camera used with no temporal resolution [7]. Our device allows the reconstruction of either a single temporal signal with monochrome images or wavelength-multiplexed signals with color images. Figure 1 illustrates some results obtained with our device.

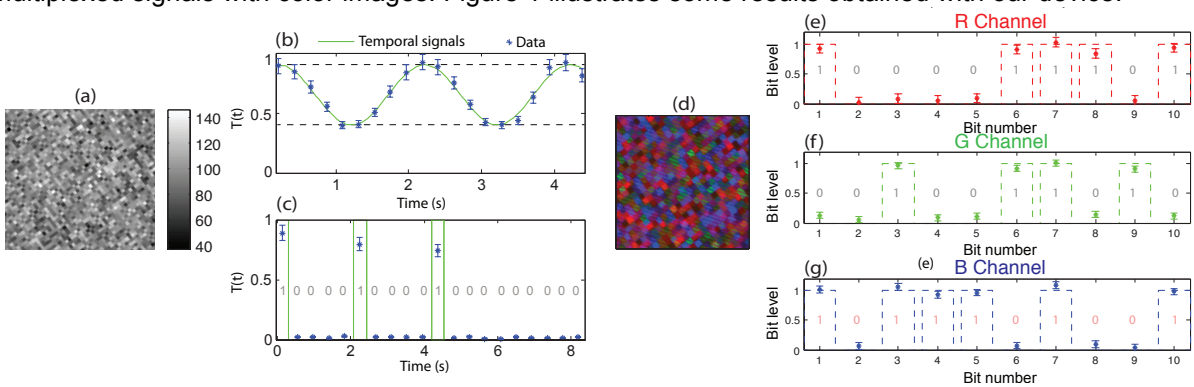

Fig. 1: (a) monochrome and (d) color ghost images where temporal signals are embedded. (b) and (c) single shot measurement of two kind of signal embedded in a monochrome image. (e) to (g) single shot measurement of three different binary words of 10 bits multiplexed in the RGB channels of the color image.

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