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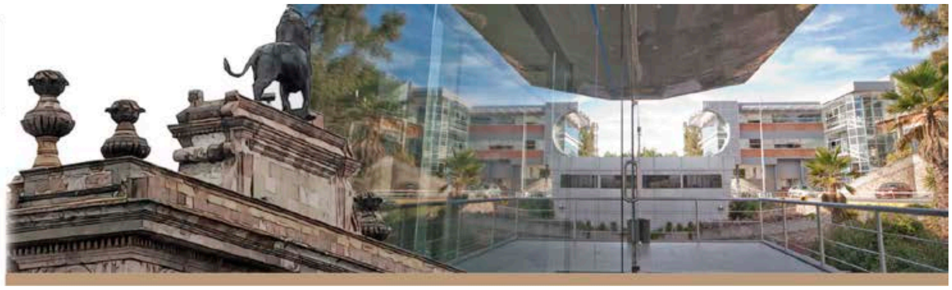

# Imaging through turbid media by single-pixel detection

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## ABSTRACT

Single-pixel cameras, as those based on the groundbreaking theory of compressive sensing, have recently emerged as a potential alternative to conventional imaging systems, specially under low-light conditions or at spectral regions where 2D image sensors are impractical. The idea of this computational imaging modality is to measure the coefficients of an object when it is expressed into a given function basis. The crucial point is that the spatial information problem is shifted away from the photosensor matrix array to the spatial light modulator which generates the set of light patterns directly related to the selected basis. Based in this optical scheme, in the last years we developed some unconventional imaging techniques that use light detectors without spatial resolution, i.e., having a single pixel, as a photodiode and other dedicated sensors. In this way, we have implemented different single pixel cameras to measure not only the 2D spatial intensity distribution of the object, but also others useful dimensions of the image, as polarization, spectrum, and phase. In the second part of the presentation we discuss how single-pixel camera devices can overcome the fundamental limitation imposed by multiple scattering to successfully transmit information through a turbid medium. In the presentation we show that, in contrast with other recent schemes dealing with scattering media that use the so-called transmission matrix formalism, compressive single-pixel imaging systems do not require any calibration process and makes it possible to tackle the problem of imaging objects that are fully embedded in a turbid medium, which constitutes a key problem in biomedical science. Experimental results of the above novel imaging approaches will be shown. Having in mind the behavior of biological tissue as an inhomogeneous medium, our achievements may be the first step towards turning the current “scattering-free" imaging approach into a real diagnosis tool for biomedical research.