

**Optical Instrumentation development:
Plenoptic cameras for denoising and optical systems for biology**

30/09/2021 - Jorge Tapia

Abstract:

Optical instrumentation development has had a great impact on a diversity of research fields and has allowed facing interesting problems. For instance, digital photonic sensors have greatly evolved to maximize sensitivity and spatial, spectral, and temporal imaging resolution. However, for low-energy photons, new designs have generated new types of noise that degrade the formed-image signal-to-noise ratio to values lower than 1. Fixed-pattern noise (FPN), which is produced by the non-uniform focal-plane-array optoelectronics response, is an ill-posed problem in infrared and hyperspectral imaging science. An alternative to solve this problem is to use plenoptic imaging to perform denoising by digital refocusing. On the other hand, optical applications have been intensively used in biology. In particular, optical tweezers and membrane fluctuation spectroscopy have been developed to manipulate micro-structures and measure red blood cells membrane fluctuations using single and dual configurations. In this way, I will present an overview of instrumentation to eliminate FPN based on plenoptic camera principles and some fashion optical instrumentation used in biology.