



Title: Experimental control of laser-generated speckle patterns

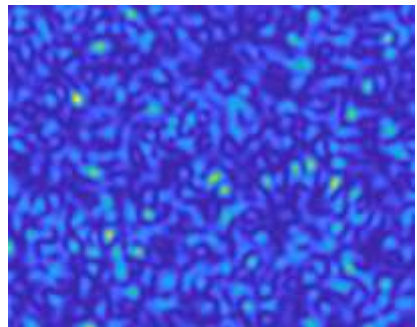
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Keywords: diode lasers, speckle

Description:

Diode lasers are popular light sources for imaging because they are low-cost, emit a stable output, and cover a wide range of wavelengths. However, illumination with coherent diode laser light produces a spatial interference pattern, known as a speckle pattern (shown in the fig.), which is detrimental for the image quality. On the other hand, speckle contains useful information about the spectral properties of the light and of the scattering medium that generates the speckle.

We have recently shown that the speckle contrast can be minimized (which is desirable for imaging applications) or maximized (which is desirable for applications that extract information from speckle patterns) by tuning the pump current of the laser and the settings of the image acquisition system.



The goal of the project, which can be a Bachelor or a Master thesis, is to test whether current modulation and optical feedback from an external mirror can be used to control the degree of coherence of the light emitted by the diode laser, thus allowing to further increase or decrease the amount of speckle.

This project requires experimental work in our lab, which is doable in present COVID situation because we have a large, well-equipped and well-ventilated lab, where only one or two persons work simultaneously.

References:

- [1] D. Halpaap, J. Tiana-Alsina, M. Vilaseca, C. Masoller, “*Experimental characterization of the speckle pattern at the output of a multimode optical fiber*”, Opt. Express 27, 27738 (2019).
- [2] D. Halpaap et al., “*Experimental study of speckle patterns generated by low-coherence semiconductor laser light*”, Chaos 30, 063147 (2020).

Required skills: Knowledge of Matlab, python, LabVIEW is desirable but not mandatory.

Additional information: A scholarship is possible depending on the skills of the candidate.