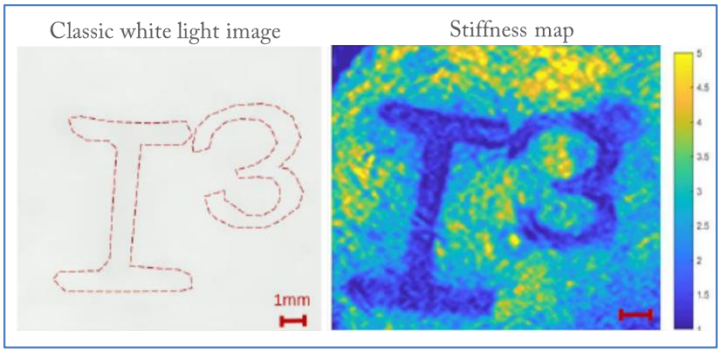
Micro-elastography of biological tissues using digital holography

Lab: Laboratoire ICube Strasbourg, France

Team : IPP



Context: Organ structures, tissues and cells have distinctive intrinsic mechanical properties. Moreover, the mechanical properties of tissues and cells are related to their structure and function: changes in those properties can reflect healthy or pathological states. In our group, we currently develop a new approach to measure quantitative mechanical properties of biological tissues (Figure 1). This approach, based on the time reversal of diffuse shear wave field naturally generated inside the body, is totally passive, non-contact and real time.

Description: The objective of this internship is to develop a high-resolution version of the current setup in order to probe mechanical properties of tissues at the cellular level using classical high-resolution digital holography and microsphere assisted super-resolved digital holography.
The student will work on the optical system design and the optimization of the existing time reversal based algorithm.

Basic knowledge in optical instrumentation and image processing with Matlab or python are recommended

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Possible PhD position: yes (école doctorale)

References:

[1] Cuche, E., Marquet, P., & Depeursinge, C. (2000). Spatial filtering for zero-order and twin-image elimination in digital off-axis holography. Applied optics, 39(23), 4070-4075.

[2] Marmin, A., Catheline, S., & Nahas, A. (2020). Full-field passive elastography using digital holography. Optics Letters, 45(11), 2965-2968.

[3] Nahas, A., Tanter, M., Nguyen, T. M., Chassot, J. M., Fink, M., & Boccara, A. C. (2013). From supersonic shear wave imaging to full-field optical coherence shear wave elastography. Journal of biomedical optics, 18(12), 121514.