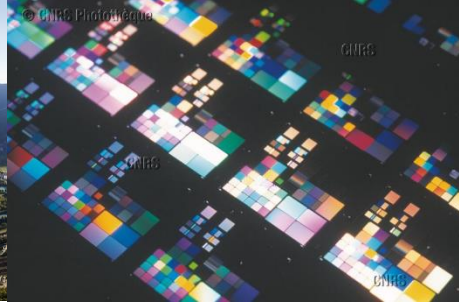


Master 2 Internship

Feasibility and prototyping of a very wide field lensless microscope using the displacement of a linear sensor

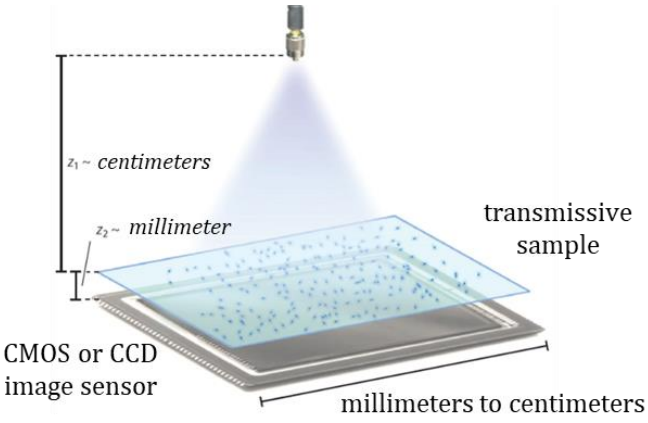
Keywords: Prototyping, light microscopy, lensless imaging, interferogram, image reconstruction

Context :

Usually, microscopic imaging is done using lenses, usually in a microscope. However, recently, lensless imaging has become a promising alternative. In this technique, a diffraction image resulting from an object is recorded directly on a digital image sensor without being optically imaged or magnified by a lens (figure below). This diffraction pattern is then interpreted using an electromagnetic simulation (called "reconstruction") to find a more precise image of the object. The recent development of lensless imaging has been made possible in large part by the mass production of inexpensive digital image sensors as well as improvements in the computational power and reconstruction algorithms used. Compared to conventional microscopy, lensless approaches have several advantages: a large field of view associated simultaneously with high resolution, low cost and an extremely compact device. These advantages make this technique particularly well suited in applications with a large sample volume, for statistical studies, or for medical diagnosis, possibly in the field. Also, these imagers can be easily installed in an incubator to continuously monitor microbial growth.

Objectives:

In this context, the objective of the Master's internship is to develop a new lensless imager prototype no longer based on a 2D digital image sensor but on a linear imager from a commercial high-resolution consumer scanner. The advantage here is a huge observation field (> 10 * 10 cm^2), a dimension allowing the complete reading of a 90 mm diameter Petri dish typically used in pathogen research / microbial studies. These technical developments also require software developments both for image acquisition but more importantly for image reconstruction of the sample. This work will be carried out within the “Micro and nanotechnologies for health” team of the LTM in collaboration with the PHELIQS laboratory of the fundamental research department (DRF) of the CEA for prototyping and the DTBS / CEA-LETI for tests on agars / to assess the interest of the technique in a context of research applied to health.



Hosting lab:
Laboratoire des Technologies de la Microélectronique (LTM/CNRS)
CEA-LETI-Minatec campus
17 avenue des martyrs 38000 Grenoble

- ✓ **Duration: 6 mois**
- ✓ **Starting March 2021**

TO APPLY

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