High Resolution Three-Dimensional Coherent Imaging for Cancer Detection

Advantages
- Larger depth of focus and higher imaging speed than OCM
- Finer resolution than OCT
- No moving parts lends to a robust probe

Invention
An optical probe featuring a dynamic focusing objective made of a liquid lens or liquid crystal lens that acquires scattering information from a 3D sample media for the production of an image. 2D images are acquired at discrete depths and then stitched together post-process to yield a 3D image.

Background
As skin cancer emerges as the most prevalent type diagnosed, a viable new method for early detection is desired. Currently, as with most cancers, biopsy is the accepted norm. Unfortunately, though, biopsy is a small and random sampling that tends to be inconclusive upon first measurement. Many researchers worldwide have worked to develop imaging techniques to generate a new tool for this application but have fallen short. Optical Coherence Tomography (OCT) and Microscopy (OCM) have made researchers hopeful, but neither method has been able to provide both the fine resolution and the depth of measurement necessary.

Researchers at UCF have, therefore brought these two techniques together into what is deemed: Gabor Domain Optical Coherence Microscopy (GD-OCM). The new method combines the high resolution of OCM, the high imaging speed of OCT, and the invariant lateral resolution of a custom designed dynamic focusing objective. It is able to achieve a lateral resolution of less than 3 µm across a 2mm field of view and 2mm imaging depth in an optical probe with no moving parts.

Application
Envisioned herein, suspicious skin tissue may be imaged to diagnose for skin cancer in a completely non-invasive and repeatable procedure. This technology can, however, be applied to 3D imaging needs into any scattering material.

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Selected References

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