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Development of a low budget and compact Optical Coherence Tomography at 840 nm wavelength region for 3D imaging of biological tissues

Optical coherence tomography or OCT is an optical imaging technology that is capable of high-speed three-dimensional cross-sectional imaging of samples, such as biological samples as well as other transparent media, at high resolution. Most importantly, OCT can be operated at a light wavelength in near-infrared region with a low illumination power of a few milliwatts. Therefore, OCT is a non-destructive and non-invasive imaging technique that has potential for large area of applications in biology, biomedical science, agriculture, as well as in material science. In this work, we present a custom design and implementation of a portable OCT prototype that aims for low budget, compact size for field operation. For this purpose, the system has been designed at an operating wavelength of around 840 nm. The prototype was designed in the form of microscope setup. The implementation was based on all commercially available optical components. To the current progression, the developed prototype can perform depth cross-sectional imaging of up to 2 mm from the sample's surface. The maximum imaging speed is about 20 frames per second for the image size of 1000 depth scans per frame as limited by the speed of the detection unit. The depth resolution and lateral resolution of the developed system were measured to be about 10 microns and 10 microns, respectively. The prototype has been used for 3D imaging of several biological samples. Some imaging results will be presented and discussed.

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