Session 11 : Biophotonics

Integrated optical imaging and spectroscopy approach for biological tissue characterization in the spatial frequency domain

David Abookasis and Daniel Baruch
Department of Electrical Engineering, Ariel University, Israel

ABSTRACT

We present, a noncontact optical setup integrating spectrometer and camera arrays to quantify optical properties of both tissue-phantoms and biological tissue by spatial light modulation. In this setup, sinusoidal light patterns are serially projected onto the sample at both low and high spatial frequencies to isolate the target's absorption (linked to tissue metabolism) and scattering (related to tissue structure) properties. The diffuse reflected light is simultaneously acquired by single spectrometer and passes through two cameras. In addition to the extraction of the tissue's optical properties, we calculated hemoglobin oxygen saturation levels from the hands of healthy human volunteers. An additional validation methodology based on the theoretical model-based diffusion equation in the spatial frequency domain was demonstrated. A major advantage of this parallel optical configuration lies in the ability of each component to complement the other, enabling high spectral and spatial resolution. Overall, this work demonstrates the potential of the integrated setup for diagnostic and research applications which we believe will be beneficial to the Biophotonics' community.

***Index Terms*:** Integrated optical system; Tissue characterization; Spatial frequency domain; Reflectance spectroscopy; Oxygen saturation level.