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Simultaneous measurements of absorption, scattering, and refractive index parameters of mouse brain tissue by NIR structured illumination and models approximation

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Successful derivation of biological tissue optical parameters such as absorption, reduced scattering, and refractive index coefficients can serve a range of downstream diagnostic and research applications. A practical measurement procedure for determination of these intrinsic parameters in the near-infrared (NIR) spectral range is suggested. Structured light patterns at low and high spatial frequencies of six wavelengths ranging between 690 and 970 nm were projected onto biological tissue surface. In the offline analysis pipeline, four different approaches based on Maxwell equations and Kramers–Kronig relations were applied on the recorded images at each wavelength to resolve tissue parameters. For the wavelength-dependent properties presentation, Mie approximation and dispersion models were utilized. Our approach, validated in mouse (n=5) experience heatstroke condition, show variations from baseline measurements in the intrinsic brain properties following injury which in turn reflect brain hemodynamics and morphological variations. Overall, this work demonstrates a proof-of-concept of the proposed method which we believe will be beneficial to the biophotonics community.

Biography

David Abookasis is a faculty member in the Department of Electrical Engineering at Ariel University, Israel where is serve also as the head of the medical engineering program. His main research focus on optical diagnosis and therapy in neurological diseases and brain trauma. Dr. Abookasis possesses a multi-disciplinary background combining engineering, optics, biomedical optics, medical instrumentations, and neurology.

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