CHALLENGES OF AND DEVELOPMENTS TOWARDS OFF-CONTACT DIFFUSE REFLECTANCESPECTROSCOPY

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Diffuse reflectance spectroscopy (DRS) being a many-decades-long near-mature technology is finding new applications that may not be addressed well by other forms of spectroscopy or light-based technologies. Some of those applications that must take non-contact or off-contact means of measurement face unique challenges regarding how DRS can be implemented. For example, DRS may be utilized to characterize the below-surface myoglobin oxygenation that impacts the meat industry, but the realization is challenging.

This talk will present recent developments in the theoretical models and experimental methods of DRS that not only are specifically useful to non-contact or off-contact applications but also help advance the general understanding of DRS. The new theoretical models and experimental methods have been prompted by addressing the “photon budget” issue of DRS. Although being not exclusive to non-contact DRS, the “photon-budget” issue becomes significant in association with non-contact applicator-probe when needing to also provide differential sensitivities between the surface and below-surface properties.

We present how the method of area-collection versus spot-collection helps ease the “photon budget” issue and how the combination of center-accepted and center-blocked area-collection approaches help improve the differential sensitivities between the surface and below-surface properties. These understandings have been facilitated by new insights into the analytical model-approach supported by Monte Carlo simulations and experimental validations. On-going work to capitalize these new developments will be discussed.

Biography

Daqing (Daching) Piao, PhD received BS in Physics (Applied Optics) in 1990 from Tsinghua University, Beijing, China. He earned MS and PhD, both in Biomedical Engineering, in 2001 and 2003, respectively, from the University of Connecticut (UCONN), Storrs, CT. After a total of two years of post-doctoral training in UCONN and Dartmouth College, he joined the faculty of the School of Electrical and Computer Engineering at Oklahoma State University in 2005. His research interest centers on applying light-tissue interaction principles for identifying and modulating tissue properties. Among the recognitions he has received, a New Investigator Award from the Prostate Cancer Research Program of DoD (Army Medical Research and Material Commaond) recognized his origination of transrectal diffuse optical tomography and the combination of it with transrectal ultrasound for prostate cancer research.