SPIE Student Seminar Series

Dr. Elvis Duran Sierra

(Texas A&M University)

Noninvasive autofluorescence image-guided discrimination of malignant oral lesions vs. healthy oral tissue

Tuesday, November 24, 2020

11:00 am ~ 12:00 pm (CST)

ZOOM ID: 940 6785 8834

Abstract: Incomplete head and neck cancer resection occurs in up to 85% of cases, leading to increased odds of local recurrence and regional metastases; thus, image-guided surgical tools for accurate, in situ and fast detection of positive margins during head and neck cancer resection surgery are urgently needed. Oral epithelial dysplasia and cancer development is accompanied by morphological, biochemical, and metabolic tissue and cellular alterations that can modulate the autofluorescence properties of the oral epithelial tissue. We hypothesized that several autofluorescence morphological and metabolic biomarkers of oral cancer can be clinically imaged and used within a computer aided detection (CAD) system for oral cancer screening. To test this hypothesis, we acquired in vivo multispectral fluorescence lifetime imaging (FLIM) endoscopy images of 34 clinically suspicious oral lesions and 34 paired normal oral tissue images from the oral cavity of patients undergoing tissue biopsy examination for the diagnosis of oral cancer. Based on their histopathological diagnosis, the imaged lesions were classified as Mild/Moderate-Dysplastic (n=2), High-Grade-Dysplastic (n=3) and Cancerous (n=29) lesions. A Quadratic Discriminant Analysis classifier, designed to discriminate Mild/Moderate/High-Grade-Dysplastic and Cancerous from healthy oral tissue, was developed using up to three systematically selected FLIM-derived features. Using a seven-fold cross-validation approach, levels of sensitivity, specificity, and area under the receiver operating characteristic curve of 91%, 71%, and 0.91, respectively, were estimated. The results of this study demonstrate the potentials of a CAD system based on multispectral FLIM endoscopy as a non-invasive clinical tool for automated oral cancer screening.

Bio: Dr. Elvis Duran Sierra earned his Ph.D. in Biomedical Engineering from Texas A&M University. In his graduate work, he used statistical analyses and state-of-the-art machine learning pipelines to address challenges related to oral cancer diagnosis. His research makes contributions to the application of fluorescence lifetime imaging for the discovery of novel clinically relevant biomarkers of oral cancer that can enable successful discrimination between Cancerous vs. Normal (healthy) oral tissue, and Cancerous vs. Benign oral lesions from patients. He currently is an post-doctoral researcher in Biomedical Engineering at Texas A&M University. His research interest is machine learning-based cancer detection.

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