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Dynamic segmentation of eye fundus images and macular thickness estimation for the early detection of diabetic macular edema

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Diabetic Macular Edema (DME) is one the principal consequence of diabetes. The DME is one of the major responsible for the partial or total loss of vision in people with diabetes, its diagnosis and treatment requires a medical sub specialists in retina and Optical Coherence Tomography (OCT) equipment. This research presents a platform for macular thickness estimation from 2D images characteristics using two curve fitting methods, Regression Analysis (RA) and Artificial Neural Networks (ANN). A database of 76 sets of eye fundus images and OCT test was generated. Three dynamic algorithms were performed for blood vessel segmentation, noise reduction and Geometrical Spatial Transformation (GST) between two retinograph and one OCT images. From image were obtained nine characteristics. A Correlation Analysis (CA) was implemented using the nine obtained parameters and the macular thickness value given by the OCT. In CA two characteristics presented better correlation index, red color component and Opponent Color Space (OCS) transformation (0.69 and 0.766, respectively). Using these characteristics as inputs, there were performed eight ANNs and eight RAs. Considering red color component as input, 100% of ANNs presented better thickness estimation compared with RAs. For OCS as input, only 67% of the ANNs presented better estimation compared with RAs. The presented research allows to infer that macular thickness estimation can be performed using 2D image features this can be assumed since a high correlation index between two characteristics of the image and the thickness given by the tomography was found.

Biography

Ricardo Diaz-Dominguez has completed Bachelors in Biomedical Engineering and MSc in Computer Sciences, both at Tecnológico de Monterrey. He has worked as a Research Assistant in the Traslacional Medicine Center. As an undergraduate, he has worked as an Intern at Centro Medico Puerta de Hierro (CMPDH) in the Biomedical Engineer Department. He has worked as a Coordinator of the Biomedical Engineering Department at Cruz Roja Mexicana Delegación Guadalajara. He is currently an Associate Director of the Medicine Undergraduate Careers and Faculty Member of the Biomedical Engineering Department at Tecnológico de Monterrey.

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