Screening System for Deep Vein Thrombosis

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Abstract

Deep vein thrombosis (DVT) is a condition where blood clots or thrombi are formed within the deep veins. Thrombi may occlude venous flow and other complications, or break off from the vessel wall and cause a possibly fatal pulmonary embolism. Early detection of DVT is therefore extremely important, in order to deliver prompt treatment and reduce complications.

A system for vessel characterization aimed at detecting DVT in the lower limbs has been developed and evaluated at the University of British Columbia, Canada, using ultrasound image processing, location and force sensors measurements, blood flow information and a protocol based on the current clinical standard, compression ultrasound. The goal is to provide an objective and repeatable system to measure DVT in a rapid and standardized manner, as this has been suggested in the literature as an approach to improve overall detection of the disease.

In this talk, the main contributions of the system will be presented, including a vessel segmentation approach using a spatial Kalman filter-based algorithm, temporal constant velocity Kalman filters for tracking vessel location in real-time and objective measures for vessel characterization. Further contributions will also be discussed, which include an integrated system for DVT detection that can combine ultrasound B-mode, colour flow and elastography images for vessel characterization, a system interface design focusing on usability that was evaluated with medical professionals, and system evaluations through multiple patient studies.

Julian Guerrero received his Ph.D. (2008) in Electrical Engineering and his M.A.Sc. (2003) from the University of British Columbia and his B.Eng degree (1999) in Electrical Engineering and Communications from the Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), in Cuernavaca. He has authored several conference and journal papers, including publications in IEEE Transactions on Biomedical Engineering and IEEE Transactions on Medical Imaging. In addition, he has served as a peer reviewer in top tier conferences and journals.

His research interests are image processing and analysis, specifically with respect to medical applications, and with their application in the development of biomedical projects. He is currently a member of the IEEE.