

THE CENTRE FOR PATTERN ANALYSIS AND MACHINE INTELLIGENCE IN ASSOCIATION WITH
IEEE ENGINEERING IN MEDICINE □ BIOLOGY AND

SIGNAL PROCESSING CHAPTERS OF KW SECTION PRESENTS:

Image Analysis Methods for the Evaluation of Micro-macrocirculation in Retina and Carotid

Speaker: Professor Aurélio Campilho, University of Porto (FEUP), Porto, Portugal

Date: Wednesday June 5, 2013

Time: 2:30 pm – 3:30 pm

Place: University of Waterloo, William G. Davis Centre, DC-1304 *Refreshments will be served

Abstract :

Large vessel disease (macrovascular) is related to the atherosclerotic process causing degeneration of the arterial wall and the deposition of lipids and other blood-borne material within the arterial wall of almost all vascular territories. The carotid intima-media thickness (IMT) is a measure of the lesion of the macrovasculature and it is related with the cerebral cognitive functions. IMT can be measured using US imaging, which uses safe non-ionizing radiations. The microcirculation lesions can be related with the retinal microcirculation. It is known that eye fundus lesions of hypertensive patients appear together with vascular-cerebral changes, at least in more advanced stages. The retina vasculature is a unique region where the vascular condition is observed in vivo, and can be evaluated from high-resolution eye fundus color images, like vessel calibre, retinal arteriolar-to-venular diameter ratio and vascular tortuosity. These can be used for characterizing retinal arteriolar narrowing as a sign of hypertension, or diabetic retinopathy.

In this talk we present an automatic approach for vascular segmentation, blood vessel classification and measuring of retinal arteriolar-to-venular diameter ratio (AVR) as a risk indicator of the microcirculation in retinal images. In carotid images the challenge is to obtain accurate IMT measures. We will present a new automated layer extraction in ultrasound images for the segmentation and IMT measurement of the carotid wall.

To prevent and reduce stroke burden we need to be able to access and reliably evaluate both large (macrovascular) and small (microvascular) vessels. Their relationship is largely unknown. With these new image analysis methods we hope to contribute to the evaluation of pre-symptomatic stage of vascular changes, where the automatic measurement of IMT and AVR can be used as a “window” to cerebral vessels pathology.

Bio:

Aurélio Campilho is a Full Professor in the Department of Electrical and Computer Engineering, Faculty of Engineering, University of Porto (FEUP), Porto, Portugal. From 1994 to 2000, he served as Chairman of the Institute for Biomedical Engineering (INEB). For several years, he also served as President of the Portuguese Association for Pattern Recognition, which is a member of the IAPR. He is the Director of Doctoral Program in Electrical and Computer Engineering at FEUP and member of the Scientific Committee of the Master degree in Bioengineering, offered at the University of Porto. He is the coordinator of INEB Bioimaging Group. His current research interests include the areas of medical image analysis, image processing, and computer vision. Prof. Campilho served as the organizer of several special issues and conferences. He served as Associate Editor of the IEEE Transactions on Biomedical Engineering and of the Machine Vision Applications journals. He is chairman of the series of conferences ICIAR - International Conference on Image Analysis and Recognition.