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Quantitative Gabor feature analysis of collagen fibers in harmonically generated microscopy (HGM) imaging

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Medical images provide significant diagnostic information for medical staff under the clinical environment. In the past, with further manual analysis and diagnosis by doctors in person, patients' conditions and diseases could be identified. However, that is subjective and the result may differ from one doctor to another and even for the same doctor leading towards both inter and intra inconsistencies. This paper introduces an algorithm capable of automatically analyzing the features of collagen fibers within Second Harmonic Generation virtual biopsy image captured from the epidermal and dermal layers of the human skin. As required by medical doctors, crucial features of collagen fiber includes its density, thickness, and orientation diversity, facilitating analytical and quantification procedures for skin aging and pathologic diagnosis. Based on pathological properties of collagen fibers, we established a Gabor filter bank including specific scales and clear directionality, which are capable of accurately and quickly detecting different collagen fiber thickness and orientations. Moreover, our proposed algorithm could also objectively quantify these detected features. With this computer-aided diagnosis, we are able to decrease the time in feature extraction and expedite both diagnosis and hence treatment. Also, it saves the cost of adjusting hardware instruments in extracting features. Comparing to relative work in literature, our algorithm provides a more comprehensive and more accurate method in extracting features of collagen fibers providing high potentials in HGM image analysis.

Biography

Gwo Giun (Chris) Lee received BS degree in Electrical Engineering from National Taiwan University and MS and PhD degrees in Electrical Engineering from the University of Massachusetts. He joined Philips Semiconductor in 1999 and was the system architect of Philips TriMedia. He was the Chief Architect for a Motion Compensated Frame Rate Converter named Condor which was a part of the group with Gerard De Hann. He was an architect for one of Philips' first SoC name PNX8500 formerly known as Viper. He was also the Director of Quanta Research Center of Taiwan. Since 2003, he has been a faculty member of the Department of Electrical Engineering in National Cheng Kung University, Tainan, Taiwan, where he established the Media SoC Laboratory. He was also a visiting Professor in EPFL during 2007. He authored several technical papers and serves as a technical committee member for "Visual Signal Processing and Communications" and "Multimedia Systems Application" tracks for IEEE International Symposium on Circuits and Systems. He is currently an MPEG delegate and is a member of MPEG's Video, Implementation Study (ISG), and Reconfigurable Video Coding (RVC) groups. He is the inventor of several US and European patents in VLSI design of multimedia related fields. His research interests include algorithm, architecture, and SoC design for digital visual and intelligent signal processing.

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