Electrical & Computer Engineering

S E M I N A R

Louisiana State University

Perceptual Image Quality Assessment: From Error Visibility to Structural Similarity

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Abstract—Image quality assessment (IQA) research aims to provide objective measures that can automatically predict perceived image quality. An IQA measure can play an important role in a large number of image processing applications, for algorithm optimization and benchmarking purposes. In the last three decades, researchers have followed an error visibility framework, which attempts to quantify the visibility of error (difference) between a reference and a distorted image using human visual system features. In this talk, I will introduce a different paradigm for IQA based on the hypothesis that the human visual system is highly adapted for extracting structural information from the scene, and therefore structural distortion measure should provide a good prediction of perceptual image quality. A specific structural similarity index is developed and its effectiveness is demonstrated through a set of striking examples, as well as comparison to subjective ratings on a large image database. In the last part of the talk, I will briefly discuss our recent finding about a new statistical regularity of images: the wavelet local phase coherence, which lays the groundwork of a theory that has a broad range of potential applications in machine vision and image processing. Perhaps more interestingly, it also provides the possibility to design new signal detection devices that can "see beyond the Nyquist limit".

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