Characterizing Various Visual Signals for Human and Machine Users

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Abstract:

Human demands are unlimited at all times, while resources to meet those wants are always scarce, as indicated by Economics 101. In big visual data computing, we can address the challenge by evaluating two basic characteristics of signals: visual sensitivity, and visual quality; the formulation of this dual provides the ground for differential treatments of visual signals (images and videos) throughout their life cycles, under the constraint of available resources (bandwidth, memory, battery, computation, device cost/size, etc). Research on each characteristic can aim at systems and services for either humans or machines as final users.

In this talk, we will firstly present the computational models of the dual with humans as final users. Just-noticeable difference (JND) and visual attention and saliency (VAS) are used for visual sensitivity, while visual quality can be quantified via image quality assessment (IQA) or video quality assessment (VQA). The modeling can be in absolute sense or utility-based (e.g., the requirement of art appreciation is different from that of videoconferencing). Machines are expected to become the final users for increasing amount of visual signals in the AI era, and we will therefore also investigate into the new concepts with machines as final users, including early examples of machine-oriented JND, and saliency and quality models for 3D point clouds. Finally, possible further research topics will be highlighted, inclusive of exploration toward true multimedia that consists of hearing, smell, touch and even taste aspects as well.

Bio:

Lin Weisi is an active researcher in intelligent image processing, perception-based signal modelling and assessment, video compression, and multimedia communication. He had been the Lab Head, Visual Processing, in Institute for Infocomm Research (I^2R). He is a Professor in School of Computer Science and Engineering, Nanyang Technological University, where he also served as the Associate Chair (Research).

He is a Fellow of IEEE and IET, and has been awarded Highly Cited Researcher 2019 and 2020 by Web of Science. He has elected as a Distinguished Lecturer in both IEEE Circuits and Systems Society (2016-17) and Asia-Pacific Signal and Information Processing Association (2012-13), and given keynote/invited/tutorial/panel talks to 20+ international conferences during the past 10 years. He has been an Associate Editor for IEEE Trans. Image Process., IEEE Trans. Circuits Syst. Video Technol., IEEE Trans. Multimedia, IEEE Signal Process. Lett., Quality and User Experience, and J. Visual Commun. Image Represent. He also chaired the IEEE MMTC QoE Interest Group (2012-2014); he has been a TP Chair for IEEE 2013, QoMEX 2014, PV 2015,

PCM 2012 and IEEE VCIP 2017. He believes that good theory is practical, and has delivered 10+ major systems and modules for industrial deployment with the technology developed.