

Chenwei Deng · Lin Ma
Weisi Lin · King Ngai Ngan *Editors*

Visual Signal Quality Assessment

Quality of Experience (QoE)

 Springer

Visual Signal Quality Assessment Quality Of Experience Qoe

**Giuseppe Valenzise, Martin Alain, Emin
Zerman, Cagri Ozcinar**



Visual Signal Quality Assessment Quality Of Experience Qoe:

Visual Signal Quality Assessment Chenwei Deng,Lin Ma,Weisi Lin,King Ngi Ngan,2014-11-11 This book provides comprehensive coverage of the latest trends advances in subjective and objective quality evaluation for traditional visual signals such as 2D images and video as well as the most recent challenges for the field of multimedia quality assessment and processing such as mobile video and social media Readers will learn how to ensure the highest storage delivery transmission quality of visual content including image video graphics animation etc from the server to the consumer under resource constraints such as computation bandwidth storage space battery life etc Camera Image Quality Benchmarking Jonathan B. Phillips,Henrik Eliasson,2018-01-09 The essential guide to the entire process behind performing a complete characterization and benchmarking of cameras through image quality analysis Camera Image Quality Benchmarking contains the basic information and approaches for the use of subjectively correlated image quality metrics and outlines a framework for camera benchmarking The authors show how to quantitatively compare image quality of cameras used for consumer photography This book helps to fill a void in the literature by detailing the types of objective and subjective metrics that are fundamental to benchmarking still and video imaging devices Specifically the book provides an explanation of individual image quality attributes and how they manifest themselves to camera components and explores the key photographic still and video image quality metrics The text also includes illustrative examples of benchmarking methods so that the practitioner can design a methodology appropriate to the photographic usage in consideration The authors outline the various techniques used to correlate the measurement results from the objective methods with subjective results The text also contains a detailed description on how to set up an image quality characterization lab with examples where the methodological benchmarking approach described has been implemented successfully This vital resource Explains in detail the entire process behind performing a complete characterization and benchmarking of cameras through image quality analysis Provides best practice measurement protocols and methodologies so readers can develop and define their own camera benchmarking system to industry standards Includes many photographic images and diagrammatical illustrations to clearly convey image quality concepts Champions benchmarking approaches that value the importance of perceptually correlated image quality metrics Written for image scientists engineers or managers involved in image quality and evaluating camera performance Camera Image Quality Benchmarking combines knowledge from many different engineering fields correlating objective perception independent image quality with subjective perception dependent image quality metrics

High Efficiency Video Coding and Other Emerging Standards K.R. Rao,J.J. Hwang,D.N. Kim,2022-09-01 High Efficiency Video Coding and Other Emerging Standards provides an overview of high efficiency video coding HEVC and all its extensions and profiles There are nearly 300 projects and problems included and about 400 references related to HEVC alone Next generation video coding NGVC beyond HEVC is also described Other video coding standards such as AVS2

DAALA THOR VP9 Google DIRAC VC1 and AV1 are addressed and image coding standards such as JPEG JPEG LS JPEG2000 JPEG XR JPEG XS JPEG XT and JPEG Pleno are also listed Understanding of these standards and their implementation is facilitated by overview papers standards documents reference software software manuals test sequences source codes tutorials keynote speakers panel discussions reflector and ftp web sites all in the public domain Access to these categories is also provided Versatile Video Coding Humberto Ochoa Dominguez,K.R. Rao,2022-09-01 Video is the main driver of bandwidth use accounting for over 80 per cent of consumer Internet traffic Video compression is a critical component of many of the available multimedia applications it is necessary for storage or transmission of digital video over today's band limited networks The majority of this video is coded using international standards developed in collaboration with ITU T Study Group and MPEG The MPEG family of video coding standards begun on the early 1990s with MPEG 1 developed for video and audio storage on CD ROMs with support for progressive video MPEG 2 was standardized in 1995 for applications of video on DVD standard and high definition television with support for interlaced and progressive video MPEG 4 part 2 also known as MPEG 2 video was standardized in 1999 for applications of low bit rate multimedia on mobile platforms and the Internet with the support of object based or content based coding by modeling the scene as background and foreground Since MPEG 1 the main video coding standards were based on the so called macroblocks However research groups continued the work beyond the traditional video coding architectures and found that macroblocks could limit the performance of the compression when using high resolution video Therefore in 2013 the high efficiency video coding HEVC also known as H 265 was released with a structure similar to H 264 AVC but using coding units with more flexible partitions than the traditional macroblocks HEVC has greater flexibility in prediction modes and transform block sizes also it has a more sophisticated interpolation and de blocking filters In 2006 the VC 1 was released VC 1 is a video codec implemented by Microsoft and the Microsoft Windows Media Video VMW 9 and standardized by the Society of Motion Picture and Television Engineers SMPTE In 2017 the Joint Video Experts Team JVET released a call for proposals for a new video coding standard initially called Beyond the HEVC Future Video Coding FVC or known as Versatile Video Coding VVC VVC is being built on top of HEVC for application on Standard Dynamic Range SDR High Dynamic Range HDR and 360 Video The VVC is planned to be finalized by 2020 This book presents the new VVC and updates on the HEVC The book discusses the advances in lossless coding and covers the topic of screen content coding Technical topics discussed include Beyond the High Efficiency Video Coding High Efficiency Video Coding encoder Screen content Lossless and visually lossless coding algorithms Fast coding algorithms Visual quality assessment Other screen content coding algorithms Overview of JPEG Series **Proceedings of the 15th International Conference on Ubiquitous Computing & Ambient Intelligence (UCAmI 2023)** José Bravo,Gabriel Urzáiz,2023-11-24 This book serves as a comprehensive compilation of groundbreaking research endeavors within the realms of ambient intelligence and ubiquitous computing These initiatives are pivotal in enabling both

researchers and practitioners to discern recent breakthroughs and emerging frontiers in these fields Encompassing a wide array of domains including Ambient Active and Assisted Living A3L the Internet of Things IoT Smart Environments Data Science and Human Ambient Interaction acts as a valuable resource for scholars professionals and graduate students alike The primary aim of this book is to empower individuals within the academic and professional community to harness this wealth of knowledge It equips them to tackle innovative challenges and engineer smart and ubiquitous solutions that will shape the landscape of the next decade By amalgamating insights from various facets of ambient intelligence and ubiquitous computing this book encourages cross disciplinary collaboration and fosters a holistic understanding of the field Thus it not only highlights the recent strides in these areas but also serves as a roadmap for future exploration and innovation paving the way for a smarter and more interconnected world

Immersive Video Technologies Giuseppe Valenzise, Martin Alain, Emin Zeman, Cagri Ozcinar, 2022-09-29 Get a broad overview of the different modalities of immersive video technologies from omnidirectional video to light fields and volumetric video from a multimedia processing perspective From capture to representation coding and display video technologies have been evolving significantly and in many different directions over the last few decades with the ultimate goal of providing a truly immersive experience to users After setting up a common background for these technologies based on the plenoptic function theoretical concept Immersive Video Technologies offers a comprehensive overview of the leading technologies enabling visual immersion including omnidirectional 360 degrees video light fields and volumetric video Following the critical components of the typical content production and delivery pipeline the book presents acquisition representation coding rendering and quality assessment approaches for each immersive video modality The text also reviews current standardization efforts and explores new research directions With this book the reader will a gain a broad understanding of immersive video technologies that use three different modalities omnidirectional video light fields and volumetric video b learn about the most recent scientific results in the field including the recent learning based methodologies and c understand the challenges and perspectives for immersive video technologies Describes the whole content processing chain for the main immersive video modalities omnidirectional video light fields and volumetric video Offers a common theoretical background for immersive video technologies based on the concept of plenoptic function Presents some exemplary applications of immersive video technologies

Connected Media in the Future Internet Era Ahmet Kondo, Tasos Dagiuklas, 2016-10-08 This book describes recent innovations in 3D media and technologies with coverage of 3D media capturing processing encoding and adaptation networking aspects for 3D Media and quality of user experience QoE The contributions are based on the results of the FP7 European Project ROMEO which focuses on new methods for the compression and delivery of 3D multi view video and spatial audio as well as the optimization of networking and compression jointly across the future Internet The delivery of 3D media to individual users remains a highly challenging problem due to the large amount of data involved diverse network

characteristics and user terminal requirements as well as the user's context such as their preferences and location. As the number of visual views increases, current systems will struggle to meet the demanding requirements in terms of delivery of consistent video quality to fixed and mobile users. ROMEO will present hybrid networking solutions that combine the DVB-T2 and DVB-NGH broadcast access network technologies together with a QoE-aware Peer-to-Peer P2P distribution system that operates over wired and wireless links. Live streaming 3D media needs to be received by collaborating users at the same time or with imperceptible delay to enable them to watch together while exchanging comments as if they were all in the same location. This book is the last of a series of three annual volumes devoted to the latest results of the FP7 European Project ROMEO. The present volume provides state-of-the-art information on 3D multi-view video spatial audio networking protocols for 3D media P2P 3D media streaming and 3D Media delivery across heterogeneous wireless networks among other topics. Graduate students and professionals in electrical engineering and computer science with an interest in 3D Future Internet Media will find this volume to be essential reading.

Digital Multimedia Communications Guangtao Zhai, Jun Zhou, Long Ye, Hua Yang, Ping An, 2025-04-07. This volume contains 27 selected papers presented at IFTC 2024 21st International Forum of Digital Multimedia Communication held in Lingshui Hainan China on November 28-29, 2024. The 55 full papers included in this 2-volume set were carefully reviewed and selected from 146 submissions. They were organized in topical sections as follows: CCIS 2441 Affective Computing Graphics Image Processing for Virtual Reality Large Language Models Multimedia Communication Application of Deep Learning and Video Analysis; CCIS 2442 Human and Interactive Media Image Processing Quality Assessment and Source Coding.

Multimedia Quality of Experience (QoE) Chang Wen Chen, Periklis Chatzimisios, Tasos Dagiuklas, Luigi Atzori, 2015-11-11. Multimedia Quality of Experience QoE Current Status and Future Requirements. Multimedia Quality of Experience QoE Current Status and Future Requirements discusses the current status of QoE Quality of Experience research, providing guidelines on QoE assessment and management practice. Moreover, it covers many different aspects of QoE research, including definitions, standardization, ITU, ETSI, IEEE, IETF measurement management, and architectures. In addition, the authors bring together contributions from recognized experts worldwide in the area of subjective and objective QoE video assessment. Discusses the current status of QoE research, reporting the latest advances from various standardization bodies. Provides guidelines on QoE assessment and management practice. Explores methods, means, and architectures of QoE. Considers future requirements of QoE.

3333.1.1-2015 IEEE Standard for Quality of Experience (QoE) and Visual-Comfort Assessments of Three-Dimensional (3D) Contents Based on Psychophysical Studies, **Dissertation Abstracts International**, 2008. *Visual Quality Assessment by Machine Learning* Long Xu, Weisi Lin, C.-C. Jay Kuo, 2015-05-09. The book encompasses the state-of-the-art visual quality assessment VQA and learning-based visual quality assessment LB VQA by providing a comprehensive overview of the existing relevant methods. It delivers the readers the basic knowledge, systematic overview, and new development of VQA. It also encompasses the preliminary

knowledge of Machine Learning ML to VQA tasks and newly developed ML techniques for the purpose Hence firstly it is particularly helpful to the beginner readers including research students to enter into VQA field in general and LB VQA one in particular Secondly new development in VQA and LB VQA particularly are detailed in this book which will give peer researchers and engineers new insights in VQA

Joint Quality of Service (QOS) and Quality of Experience (QOE) Through Visual Analytics and Performance Measures for Smart City Services Gabriela N. Góngora Svartzman,2020

Quality of Experience Sebastian Möller,Alexander Raake,2014-07-08 This pioneering book develops definitions and concepts related to Quality of Experience in the context of multimedia and telecommunications related applications systems and services and applies these to various fields of communication and media technologies The editors bring together numerous key protagonists of the new discipline Quality of Experience and combine the state of the art knowledge in one single volume

Ssim-inspired Quality Assessment, Compression, and Processing for Visual Communications Abdul Rehman,2013 Objective Image and Video Quality Assessment I VQA measures predict image video quality as perceived by human beings the ultimate consumers of visual data Existing research in the area is mainly limited to benchmarking and monitoring of visual data The use of I VQA measures in the design and optimization of image video processing algorithms and systems is more desirable challenging and fruitful but has not been well explored Among the recently proposed objective I VQA approaches the structural similarity SSIM index and its variants have emerged as promising measures that show superior performance as compared to the widely used mean squared error MSE and are computationally simple compared with other state of the art perceptual quality measures In addition SSIM has a number of desirable mathematical properties for optimization tasks The goal of this research is to break the tradition of using MSE as the optimization criterion for image and video processing algorithms We tackle several important problems in visual communication applications by exploiting SSIM inspired design and optimization to achieve significantly better performance Firstly the original SSIM is a Full Reference IQA FR IQA measure that requires access to the original reference image making it impractical in many visual communication applications We propose a general purpose Reduced Reference IQA RR IQA method that can estimate SSIM with high accuracy with the help of a small number of RR features extracted from the original image Furthermore we introduce and demonstrate the novel idea of partially repairing an image using RR features Secondly image processing algorithms such as image de noising and image super resolution are required at various stages of visual communication systems starting from image acquisition to image display at the receiver We incorporate SSIM into the framework of sparse signal representation and non local means methods and demonstrate improved performance in image de noising and super resolution Thirdly we incorporate SSIM into the framework of perceptual video compression We propose an SSIM based rate distortion optimization scheme and an SSIM inspired divisive optimization method that transforms the DCT domain frame residuals to a perceptually uniform space Both approaches demonstrate the potential to largely improve the rate distortion

performance of state of the art video codecs Finally in real world visual communications it is a common experience that end users receive video with significantly time varying quality due to the variations in video content complexity codec configuration and network conditions How human visual quality of experience QoE changes with such time varying video quality is not yet well understood We propose a quality adaptation model that is asymmetrically tuned to increasing and decreasing quality The model improves upon the direct SSIM approach in predicting subjective perceptual experience of time varying video quality

Quality of Experience Engineering for Customer Added Value Services Abdelhamid Mellouk, Antonio Cuadra-Sanchez, 2014-07-09 The main objective of the book is to present state of the art research results and experience reports in the area of quality monitoring for customer experience management addressing topics which are currently important such as service aware future Internet architecture for Quality of Experience QoE management on multimedia applications In recent years multimedia applications and services have experienced a sudden growth Today video display is not limited to the traditional areas of movies and television on TV sets but these applications are accessed in different environments with different devices and under different conditions In addition the continuous emergence of new services along with increasing competition is forcing network operators and service providers to focus all their efforts on customer satisfaction although determining the QoE is not a trivial task This book addresses the QoE for improving customer perception when using added value services offered by service providers from evaluation to monitoring and other management processes

Natural Scene Statistics Based Blind Image Quality Assessment and Repair Anush Krishna Moorthy, 2012 Progress in multimedia technologies has resulted in a plethora of services and devices that capture compress transmit and display audiovisual stimuli Humans the ultimate receivers of such stimuli now have access to visual entertainment at their homes their workplaces as well as on mobile devices With increasing visual signals being received by human observers in the face of degradations that occur due to the capture compression and transmission processes an important aspect of the quality of experience of such stimuli is the emphasized perceived visual quality This dissertation focuses on algorithm development for assessing such visual quality of natural images without need for the pristine reference image i.e. we develop computational models for no reference image quality assessment NR IQA Our NR IQA model stems from the theory that natural images have certain statistical properties that are violated in the presence of degradations and quantifying such deviations from emphasized naturalness leads to a blind estimate of quality The proposed modular and easily extensible framework is distortion agnostic in that it does not need to have knowledge of the distortion afflicting the image contrary to most present day NR IQA algorithms and is not only capable of quality assessment with high correlation with human perception but also is capable of identifying the distortion afflicting the image This additional distortion identification coupled with blind quality assessment leads to a framework that allows for blind general purpose image repair which is the second major contribution of this dissertation The blind general purpose image repair framework and its exemplar algorithm

described here stem from a revolutionary perspective on image repair where the framework does not simply attempt to ameliorate the distortion in the image but to ameliorate the distortion so that visual quality at the output is maximized Lastly this dissertation describes a large scale human subjective study that was conducted at UT to assess human behavior and opinion on visual quality of videos when viewed on mobile devices The study lead to a database of 200 distorted videos which incorporates previously studied distortions such as compression and wireless packet loss and also dynamically varying distortions that change as a function of time such as frame freezes and temporally varying compression rates This study the first of its kind involved over 50 human subjects and resulted in 5 300 summary subjective scores and time sampled subjective traces of quality for multiple displays The last part of this dissertation analyzes human behavior and opinion on time varying video quality opening up an extremely interesting and relevant field for future research in the area of quality assessment and human behavior

Perceptual Quality Assessment and Processing for Visual Signals Lin Ma (Ph. D.),2013 *On Quality of Experience (QoE) for Multimedia Services in Communication Ecosystem* Khalil ur Rehman Laghari,2012 Today the fulfillment of customer demands and user experience requirements are becoming the main differentiators for gauging the effectiveness of telecom operators and service providers In this competitive market the poor Quality of Experience QoE leads to a chain reaction of negative word of mouth pushing customers into the arms of waiting competitors Therefore it is important for service providers to ensure superior quality of experience in order to avoid customer disloyalty and negative reputation QoE is a fast emerging multi disciplinary field focused on understanding overall human quality requirements from different angles such as technology business and context of use The first and foremost challenge is to understand how different influencing characteristics related to business technology and context influence human behavior In this thesis initial work addresses this challenge of understanding the influence of disparate domains over QoE A consolidated QoE interaction model is proposed which links disparate domains human business technology and context to understand overall human quality of experience requirements Then taxonomy is presented for QoE interaction model Second contribution in this thesis is based on the first and its main objective is to capture and analyze QoE data through user studies Based on user data the influence of technological contextual and business parameters over QoE are evaluated Different multimedia services were selected for user study such as video streaming service telephony VoIP and PSTN and 3D audio teleconferencing service Depending upon multimedia service different aspects were considered during each user study such as types of multimedia service parameters QoS content context the types of QoE metrics subjective objective cognitive or both human characteristics age gender etc and human roles user or customer These findings help in understanding the link between QoE and other influencing domains The third contribution is based upon ongoing work of developing QoE based tools for video streaming services Two QoE based tools for the assessment of multimedia services have been presented in this thesis their main functions are to capture analyze and report QoE metrics in real time These QoE tools

are useful for real time measurement of QoE metrics

Multipurpose Image Quality Assessment for Both Human and Computer Vision Systems Via Convolutional Neural Network Han Yin, 2017

Computer vision algorithms have been widely used for many applications including traffic monitoring autonomous driving robot path planning and navigation object detection and medical image analysis etc Images and videos are typical input to computer vision algorithms and the performance of computer vision algorithms are highly correlated with the quality of input signal The quality of videos and images are impacted by vision sensors environmental conditions such as lighting rain fog and wind Therefore it is a very active research issue to determine the failure mode of computer vision by automatically measuring the quality of images and videos In the literature many algorithms have been proposed to measure image and video qualities using reference images However measuring the quality of image and video without using a reference image known as no reference image quality assessment is a very challenging problem Most existing methods use a manual feature extraction and a classification technique to model image and video quality Internal image statics are considered as feature vectors and classical machine learning techniques such as support vector machine and naive Bayes as the classifier Using convolutional neural network CNN to learn the internal statistic of distorted images is a newly developed but efficient way to solve the problem However there are also new challenges in image quality assessment field One of them is the wide spread of computer vision systems Those systems like human viewers also demand a certain method to measure the quality of input images but with their own standards Inspired by the challenge in this thesis we propose to build an image quality assessment system based on convolutional neural network that can work for both human and computer vision system In specific we build 2 models DAQ1 and DAQ2 with different design concept and evaluate their performance Both models can work well with human visual system and outperform most former state of art Image Quality Assessment IQA methods On computer vision system side the models also show certain level of prediction power and reveal the potential of CNNs in facing this challenge The performance in estimating image quality is first evaluated using 2 standard data sets and against three state of the art image quality methods Further the performance in automatically detecting the failure mode computer vision algorithm is evaluated using Miovision s computer vision algorithm and datasets

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