

**Proceedings
of the
5th ISCA/DEGA Workshop
on
Perceptual Quality of Systems
PQS 2016**

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(Eds.)**

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Volume Editors

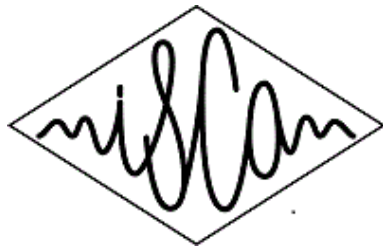
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Proceedings of the 5th ISCA/DEGA Workshop on Perceptual Quality of Systems (PQS 2016). This workshop is held on 29–31 August 2016. PQS 2016 is supported by the International Speech Communication Association (ISCA), the Deutsche Gesellschaft für Akustik e.V. (DEGA), and the Informationstechnische Gesellschaft im VDE (ITG), .



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For further information regarding PQS, please visit <http://pqs.qu.tu-berlin.de/>.

Preface

The fifth ISCA/DEGA Workshop on Perceptual Quality of Systems aims to bring together leading professionals and scientists from different fields that are all related to perceptual quality, including Quality of Experience (QoE) and User Experience (UX). Supported by the International Speech Communication Association (ISCA), the Deutsche Gesellschaft für Akustik e.V. (DEGA), and the Informationstechnische Gesellschaft im VDE (ITG), this event will serve as a forum facilitating for an interdisciplinary exchange of ideas between both academic and industrial researchers working on different aspects of perceptual quality of systems. Inaugurated in Herne/Mont Cenis (2003) and continued in Berlin (2006), Bautzen (2010), and Vienna (2013), PQS 2016 will return to Berlin, Germany, with this edition. Perceived quality of technical systems as well as user interaction behavior with such systems is grounded on human experiences and expectations, quality assessment and prediction as well as user behavior analysis and modelling have to take the relevant human factors into account. To date, that has been addressed by a number of scientific disciplines including psychophysics, cognitive psychology, speech and audiovisual quality assessment, human computer interaction (HCI), usability and user experience research, and Quality of Experience (QoE).

Following these intentions, the program committee has compiled a strong three day workshop program that demonstrates the multifaceted nature of current research on quality perception in the context of technical systems: the program ranges from the investigation of fundamental human quality perception and judgment processes as well as methodological aspects of quality and usability assessment to the evaluation and improvement of the user-perceived quality of particular technologies, systems or services. PQS 2016 is organized as a 3 day workshop at the GLS Campus Berlin which provides the perfect atmosphere for inspired discussions. The special atmosphere of PQS 2016 brings together researchers beyond the workshop program and provides an ideal location to initiate a closer interaction among the participants within this scientific field.

PQS 2016 features two keynote speeches and 30 excellent oral presentations in nine sessions. Each paper was reviewed by at least three experts in the field. Two special sessions are organized which are dedicated to quality and usability perception in gaming as well as crowdsourcing as methodology for quality and usability assessment. The oral presentations will address the quality of video, voice, audio, multi-party conferencing, gaming, as well as web and cloud services. Thereby a focus is on the influence of networking on the quality and user behavior. Furthermore, new assessment methods like eye gaze, crowdsourcing, but also testbeds for quality assessment will be discussed. Fundamentals in the formation and modeling of QoE, user behavior, usability and user experience in HCI are covered by the program. The first keynote given by Jan van Looy (Ghent University, Belgium) discusses the challenges of measuring quality of game experience. The second keynote given by Dominik Strohmeier (Senior Product Manager, Platform Metrics, Mozilla) addresses Quality of Experience as engineering goals.

Special Session Gaming

Gaming has become a multi-billion dollar industry all over the world and significant amounts of money, time and effort are being invested in developing distinguished and high quality gaming experiences. The quality of game experience is dependent on many factors which may lie outside of the control of the game publisher (e.g., Internet connection, user equipment characteristics, user's previous game experience etc.). While factors that contribute to the players' QoE are known, still the influence of specific factors and the influence of their interaction is not well understood, quantified and modelled. It is the aim of this Special Session to bring together researchers and practitioners who work on Gaming QoE, and to provide a unique podium for discussion and scientific advances in the area of QoE for digital games.

The special session on gaming is organized by

- Justus Beyer, Quality and Usability Lab, TU-Berlin,
- Oliver Hohlfeld, RWTH Aachen University, Germany,
- Mirko Sužnjević, University of Zagreb, Croatia.

Special Session Crowdsourcing

Crowdsourcing has become a valuable tool for studying and evaluating the perceptual quality of systems. It provides an easy, fast, and cost effective way to access a large number of diverse users. However, due to the highly uncontrolled environment in which crowd-based experiments are conducted, well-established lab test setups and experimental methodologies cannot be deployed without adaptations. These adaptations might involve technical changes of the test setup to support the remote devices of the participants, or methodical changes like the introduction of reliability checks to verify that the experimental task has been understood and executed properly.

In this session, we aim to foster the discussion between researchers in the field of crowdsourcing and perceptual studies to further close the gap between subjective testing and crowdsourcing. We solicit contributions addressing novel techniques to ease the use of crowdsourcing for the study of the perceptual quality of systems, successful and unsuccessful examples of crowd-sourced subjective studies that can help deriving general best practices or pitfalls, and methodical approaches that, e.g., enable better reproducibility and comparability of crowdsourcing studies.

The special session on gaming is organized by

- Judith Redi, TU Delft, The Netherlands,
- Matthias Hirth, University of Würzburg, Germany,
- Tim Polzehl, TU Berlin, Germany.

As organizers of the workshop we would like to thank everyone who contributed to the success of PQS 2016: the authors, the session chairs, the special session organizers, all members of the technical program committee as well as the members of the general and local organizing committee.

We sincerely hope that the technical program, the social events, the scientific discussions, and the inspiring atmosphere of Berlin and the workshop location will make your PQS 2016 participation a great and memorable experience.

July 2016

Jan-Niklas Antons
Sebastian Egger-Lampl
Tobias Hoßfeld
Sebastian Möller

Workshop Organization

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Sebastian Egger	AIT Vienna, Austria

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Jan-Niklas Antons	TU Berlin, Germany
Tobias Hoßfeld	University of Duisburg-Essen, Germany

Gaming Special Session Organizers

Justus Beyer	TU Berlin, Germany
Oliver Hohlfeld	RWTH Aachen University, Germany
Mirko Sužnjević	University of Zagreb, Croatia

Crowdsourcing Special Session Organizers

Judith Redi	TU Delft, The Netherlands
Matthias Hirth	University of Würzburg, Germany
Tim Polzehl	TU Berlin, Germany

Proceedings Editing

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Local Arrangements

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Weisi Lin	Nanyang Technological University, Singapore

Program

Monday, 29 August 2016

Keynote

- Jan van Looy (Ghent University, Belgium): *'It is Like a Jungle Out There!': The Challenges of Measuring Quality of Game Experience*

Session 1: Eye

- *Eye Gaze-based Service Provision and QoE Optimization* by Pietro Lungaro and Konrad Tollmar (Royal Institute of Technology (KTH), Sweden)
- *Enhancing Video Streaming Using Real-Time Gaze Tracking* by Sebastian Arndt (Norwegian University of Science and Technology, Norway); Jan-Niklas Antons (Technische Universität Berlin & Telekom Innovation Laboratories, Germany)

Special Session 2: Gaming

- *Impact of traffic optimisation on QoE of a MMORPG* by Mirko Suznjevic (University of Zagreb, Croatia); Jose Saldana (University of Zaragoza, Spain); Maja Matijasevic and Matko Vuga (University of Zagreb, Croatia)
- *A Comprehensive End-to-End Lag Model for Online and Cloud Video Gaming* by Florian Metzger (University of Duisburg-Essen, Germany); Albert Rafetseder (University of Vienna, Austria); Christian Schwartz (University of Wuerzburg, Germany)
- *Assessing the Accuracy of Network Estimations in the DOTA 2 Game Client* by Matthias Hirth (University of Wuerzburg, Germany); Fabian Allendorf (University of Würzburg, Germany); Florian Metzger (University of Duisburg-Essen, Germany); Christian Schwartz (University of Wuerzburg, Germany)

Session 3: HCI

- *Analyzing the Usability and User Experience of an Adaptive Geographic Information System* by Dénes Máté Bencze (TU Berlin, Germany); Axel Lüdtke (InterfaceMA GmbH, Germany); Sebastian Möller (Quality and Usability Lab, Telekom Innovation Labs, TU Berlin, Germany)
- *Contextual Sidebar: Effect of Context Information Quality on the Usability of a Context-aware Application* by Sebastian Möller (Quality and Usability Lab, Telekom Innovation Labs, TU Berlin, Germany); Hantang Liu (TU Berlin, Germany); Axel Spriestersbach (SAP Research, Germany)
- *User Experience in Authentication Research: A Survey* by Lydia Kraus (Technische Universität Berlin & Quality and Usability Lab, Germany); Jan-Niklas Antons (Technische Universität Berlin & Telekom Innovation Laboratories, Germany); Felix Kaiser (Technische Universität Berlin, Germany); Sebastian Möller (Quality and Usability Lab, Telekom Innovation Labs, TU Berlin, Germany)

Tuesday, 30 August 2016

Keynote

- Dominik Strohmeier (Senior Product Manager, Platform Metrics, Mozilla): *Quality of Experience as Engineering Goals*

Session 4: Fundamentals

- *A Theoretical Approach to the Formation of Quality of Experience and User Behavior in Multimedia Services* by Werner Robitza (Deutsche Telekom AG, Germany); Sabine Schönfellner (Karl-Franzens Universität Graz, Austria); Alexander Raake (Technische Universität Ilmenau, Germany)
- *On Additive and Multiplicative QoS-QoE Models for Multiple QoS Parameters* by Tobias Hoßfeld (University of Duisburg-Essen, Germany); Lea Skorin-Kapov (University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia); Poul E. Heegaard (Norwegian University of Science and Technology & NTNU, Norway); Martín Varela (VTT Technical Research Centre of Finland, Finland); Kuan-Ta Chen (Academia Sinica, Taiwan)
- *Experiential Qualities and Quality of Experience in Storytelling, and Their Measurability* by Chenyan Zhang and Aud Sissel Hoel (Norwegian University of Science and Technology, Norway); Andrew Perkis (NTNU, Norway)
- *Towards context-aware interactive Quality of Experience evaluation for audiovisual multiparty conferencing* by Marwin Schmitt (CWI: Centrum Wiskunde & Informatica, The Netherlands); Judith Redi (Delft University of Technology, The Netherlands); Pablo Cesar (CWI, The Netherlands)

Session 5: Audio & Conferencing

- *The impact of bandwidth limitations and video resolution size on QoE for WebRTC-based mobile multi-party video conferencing* by Dunja Vucic (University of Zagreb Faculty of Electrical Engineering and Computing, Croatia); Lea Skorin-Kapov (University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia); Mirko Suznjevic (University of Zagreb, Croatia)
- *Instrumental Assessment of Near-end Perceived Listening Effort* by Jan Reimes (HEAD Acoustics GmbH, Germany)
- *Objective Speech Quality Estimation of In-Ear Microphone Speech* by João Felipe Santos (INRS-EMT, Canada); Rachel Bouserhal (École de Technologie Supérieure, Canada); Jeremie Voix (ETS, Canada); Tiago Falk (INRS-EMT, Canada)
- *Non-intrusive Estimation of Noisiness as a Perceptual Quality Dimension of Transmitted Speech* by Friedemann Köster (Quality and Usability Lab, Technische Universität Berlin); Gabriel Mittag (Quality and Usability Lab, Technische Universität Berlin, Germany); Tim Polzehl (Technical University of Berlin, Germany); Sebastian Möller (Quality and Usability Lab, Telekom Innovation Labs, TU Berlin, Germany)

Session 6: Networking

- *Effects of Network Performance on Smartphone User Behavior* by Luis Guillermo Martinez Ballesteros (KTH Royal Institute of Technology & Radio Systems Lab, Sweden); Markus Örbloom (KTH Royal Institute of Technology, Sweden); Jan Markendahl (Royal Institute of Technology, Sweden); Per Skillermark (Ericsson Research, Sweden); Konrad Tollmar (Royal Institute of Technology (KTH), Sweden)
- *User Experience Measurement of a Static Website Compared to a Responsive Website using AttrakDiff Mini* by Alexander Fiebig and Marc Halbrügge (Technische Universität Berlin, Germany); Lydia Kraus (Technische Universität Berlin & Quality and Usability Lab, Germany)
- *Investigating the Extent and Impact of Time-Scaling in WebRTC Voice Over IP Traffic Under Light, Moderate and Heavily Congested Wi-Fi APs* by Mohannad Alahmadi, Yusuf Cinar and Hugh Melvin (National University of Ireland, Galway, Ireland); Peter Pocta (University of Zilina, Slovakia)

Wednesday, 31 August 2016

Session 7: Video

- *Comparison of EWPSNR and MOS on an Eye-tracking Labelled Video Dataset* by Saman Zadtootaghaj (Telekom Innovation Labs, Deutsche Telekom AG, Germany); Hamed Ahmadi (Multimedia Processing Laboratory (MPL), University of Tehran, Iran); Sebastian Möller (Quality and Usability Lab, Telekom Innovation Labs, TU Berlin, Germany)
- *Impact of user emotion and video content on video Quality of Experience* by Hajer Gahbiche Msakni (High School of Computer Science and Communications Technics, Tunisia)
- *Perceived Intra-Frame Dynamic Range In Cinema Environments* by Tine Vyvey and Elena Nunez Castellar (Ghent University, Belgium); Dirk Maes and Bruno Vandeveld (Barco nv., Belgium); Jan Van Looy (Ghent University, Belgium)
- *Viva la Resolution: The Perceivable Differences between Image Resolutions for Light Field Displays* by Péter Kara (Kingston University, United Kingdom); Peter Tamas Kovacs (Holografika, Hungary); Maria G. Martini (Kingston University, United Kingdom); Attila Barsi and Kristof Lackner (Holografika, Hungary); Tibor Balogh (Holografika Kft, Hungary)

Special Session 8: Crowd

- *Worker's Cognitive Abilities and Personality Traits as Predictors of Effective Task Performance on Crowdsourcing Tasks* by Vaggelis Mourelatos and Manolis Tzagarakis (University of Patras, Greece)
- *Reported Attention as a Promising Alternative to Gaze in IQA Tasks* by Vlad Hosu (University of Konstanz, Germany); Franz Hahn (Universität Konstanz, Germany); Igor Zingman and Dietmar Saupe (University of Konstanz, Germany)
- *One Shot Crowdttesting: Approaching the Extremes of Crowdsourced Subjective Quality Testing* by Michael Seufert (University of Würzburg, Germany); Tobias Hoßfeld (University of Duisburg-Essen, Germany)
- *Size does matter. Comparing the results of a lab and a crowdsourcing file download QoE study* by Andreas Sackl (AIT Austrian Institute of Technology, Austria); Bruno Gardlo (Telecommunications Research Center Vienna (FTW), Austria); Raimund Schatz (Austrian Institute of Technology (AIT), Austria)

Session 9: Methodology

- *Longitudinal User Experience of a Mobile Service* by Stefan Schaffer (German Research Center for Artificial Intelligence, Germany); Rene Kelpin (DLR, Germany); Norbert Reithinger (German Research Center for Artificial Intelligence, Germany)
- *Exemplary Test Design and Evaluation of an Autostereoscopic 3DTV* by Ruth Schultheis (Technische Universität Ilmenau, Germany); Sara Kepplinger and Frank Hofmeyer (Ilmenau University of Technology, Germany); Nikolaus Hottong (Hochschule Furtwangen University, Germany)
- *A Novel Approach to Multimedia Research Test Beds: Containerisation and Native Network Emulator* by Yusuf Cinar and Hugh Melvin (National University of Ireland, Galway, Ireland); Peter Pocta (University of Zilina, Slovakia); Mohannad Alahmadi (National University of Ireland, Galway, Ireland)