

# PIVP 2014: First International Workshop on Perception Inspired Video Processing

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## ABSTRACT

This is a MM'14 Workshop Summary Abstract for PIVP'14 - 1st International Workshop on Perception Inspired Video Processing. Workshop provided a venue for researchers involved with perceptual video processing and coding to present their current work and to discuss future directions. The workshop program consisted of a keynote talk, oral presentations of full papers and interactive poster session for the short papers. All participants took part in the discussion panel at the end of workshop, exchanging ideas and suggestions for future work.

## Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems - *Evaluation/Methodology, Video*. I.2.10 [Artificial Intelligence]: Vision and Scene Understanding - *Motion, Perceptual reasoning, Video analysis*.

## General Terms

Algorithms, Measurement, Performance, Design, Experimentation, Human Factors, Standardization, Theory.

## Keywords

Multimedia; Video Coding; Perceptual Video; Human Vision.

## INTRODUCTION

Video services are taking up increasingly large amount of Internet traffic today. For example, just two popular on-demand video services alone use up 49.4% of Internet downstream traffic during peak hours of 7:00 PM to 10:00 PM in the US [1]. Such on-demand video is being accessed from a range of consumer electronics

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devices such as TVs, DVRs, Blu-ray players, and mobile entertainment devices. Globally, consumer Internet video traffic will be 69% of all consumer Internet traffic in 2017, up from 57% in 2012. The sum of all forms of video (TV, video on demand, Internet, and P2P) will be in the range of 80 to 90 percent of global consumer traffic in the next three years [2]. The traditional approach to video compression based on hybrid coding (hybrid of motion compensation and transform coding) is being stretched to the limit and increasing the complexity of video encoders and decoders will not be sufficient to meet the continued bandwidth and storage demands placed by video services. As the amount of video increases, resources needed to process the video also increase. Processing tasks such as analytics and content understanding are especially resource intensive and have time critical applications. New approaches to video processing are needed to keep up with the service demands.

Video compression in its most commonly used form is designed to introduce imperceptible signal loss. As compression ratios increase, bitrate decreases, loss increases, and distortion becomes perceptible. In order to achieve compression that is close to optimal for a given distortion, a criterion has to be established to describe the quality of the reconstructed signal. Rate-distortion (RD) theory gives us a framework for modeling lossy compression [3]. In most of the cases RD models in modern video coding systems use mean squared error (MSE) and peak signal-to-noise ratio (PSNR) as a measure of distortion. There has been a significant amount of work dedicated to optimization of image and video coding based on the PSNR metric. Actually, it has been used as a distortion metric and a benchmark for most of the modern video coding standards, including the widely used codecs such as AVC/H.264 and HEVC [4, 5].

## SIGNIFICANCE

Having in mind trends and current state-of-the-art in video coding, it is clear that novel approaches to video compression are needed in order to sustain growing demand for video content. One promising direction is exploration of perceptual and cognitive paradigms that haven't been fully utilized.

Perceptual and cognitive factors affect how users acquire and process visual information, and an understanding of these factors and experiences offers opportunities to achieve the next big leap in video processing. In particular, many findings from areas such as Vision Science, Behavioral Sciences, and Neuroscience have strong implications for developing efficient, perceptually optimized video processing frameworks, algorithms, and applications

Perceptual methods for video coding can bring additional improvements in compression efficiency without affecting quality of experience [6, 7]. Another avenue of research is utilizing higher (cognitive) processing factors that are related to attention [8]. Combination of low level factors and high level processing gives promising results.

However, in order to fully exploit the possibilities of using perceptual and cognitive methods, we have to stay up to date with current developments in psychophysics and find ways to implement the findings from these studies. In this manner, PIVP workshop served as a perfect venue to present current research in both perception and cognitive inspired algorithms and methods and discuss ideas for future directions.

As another example of the workshop recognition and significance, outstanding workshop contributors are invited to submit an extended paper to the Special issue of Multimedia Tools and Applications.

## TOPICS AND GOALS

The goal of this workshop is to bring together experts working on applying models, principles, and knowledge of human audio-visual perception and cognition to optimize video processing algorithms and applications.

Specific topics of interest in this workshop include:

- Perceptual video coding
- Quality of Experience
- Video analysis
- Perceptual models for video processing
- Influence of content on perception
- Influence of emotion on video perception
- Emotion detection in videos
- Neural correlates of video
- Influence of audio on video processing
- Datasets for perceptual video research.

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