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PEM360: A dataset of 360° videos with continuous Physiological measurements, subjective Emotional ratings and Motion traces

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Abstract

From a user perspective, immersive content can elicit more intense emotions than flat-screen presentations. From a system perspective, efficient storage and distribution remain challenging, and must consider user attention. Understanding the connection between user attention, user emotions and immersive content is therefore key.
In this work, we will present the PEM360 dataset of user head movements and gaze recordings in 360° videos, along with self-reported emotional ratings of valence and arousal, and continuous physiological measurement of electrodermal activity and heart rate. The stimuli are selected to enable the spatiotemporal analysis of the connection between content, user motion and emotion. We then present findings on the tri-partite connection between user attention, user emotion and visual content in immersive environments. This involves analyzing low-level and high-level saliency of video content, in connection with the data on the user's state from the PEM360 dataset.
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CCS Concepts

• ***Human-centered computing*** → ***Virtual reality;*** *User studies;*

Immersive media and environments are on the rise with increased affordability of virtual reality (VR) equipment and the deployment of popular platforms for 360° streaming or advanced interaction in the *Metaverse*. This new type of content questions the design of compelling immersive experiences, as well as the technical choices for storage and distribution.

In light of this, our work presents the PEM360 dataset, a multimodal dataset of user head movements and gaze recordings in 360° videos, along with self-reported emotional ratings of valence and arousal, and continuous physiological measurement of electrodermal activity and heart rate. We provide a set of software tools to process the various data modalities (gaze, head motion, emotion, and content), and introduce a joint instantaneous visualization of user attention and emotion we name *Emotional maps*. We exemplify new types of analyses the PEM360 dataset can enable. All data and code are made available in a reproducible framework.

We then investigate how the accuracy of saliency estimators to predict user attention depends on user-reported and physiologically-captured emotional perceptions. Results show that high-level saliency better predicts user attention for higher levels of arousal. Our work serves as a first step to understand and predict user attention and intents in immersive interactive environments.

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