

Session Details

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Brightness in Cinema: When is it Too Bright?

Date & Time

Tuesday, October 22, 2019, 2:30 PM - 3:00 PM

Location Name

Sacramento Room

Speakers

Stelios Ploumis - The University of British Columbia

Ronan Boitard - MTT Innovation / Barco

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Recent advances in display technologies enable home and cinema display systems to reach higher peak luminance and perceived Full Screen White (FSW) levels while also improving on black level capabilities. This next generation of displaying technology will help creators deliver content of higher visual quality, increasing the overall Quality of Experience (QoE) of viewers. However, there are growing concerns in the cinema industry that possible “mismanagement” or “misuse” of the new luminance reproduction capabilities may result in viewers’ visual discomfort. A typical example of potential “misuse” is abrupt temporal brightness transitions during a scene change or even within the same scene. Prior studies, which were conducted in a home environment, reported that displaying higher amounts of light could potentially lead to viewers’ visual discomfort. However, no study has been conducted in a cinema environment. In this work, we propose to quantify the human observer tolerance of temporal brightness transitions in a cinema environment through subjective evaluations. Different experiments evaluate the impact of various distributions of light on the screen, namely full screen, highlights, and noise patterns, and real images. Results of our evaluations indicate that the light distribution, as well as the peak luminance values, have minimum impact on viewers’ tolerance to temporal brightness transitions. In fact, observers reported visual discomfort only when the total amount of light on screen was varying significantly. More specifically, average luminance transitions from 0.1 and 1 cd/m² to 35 cd/m², were rated as “slightly annoying” and average luminance transitions from 0.1 and 1 cd/m² to 75 cd/m² as “annoying”. It is also worth noting that viewers reported visual discomfort at a similar transition intensity for saturated colors and white. The results of our study could provide useful insight to content creators, for example warning about temporal transitions that may cause visual discomfort.

Technical Depth of Presentation

We would describe the technical depth of our research as advanced given the number of experiments that we conducted.

What Attendees will Benefit Most from this Presentation

The ideal audience of our presentation will be people involved to the entire pipeline of cinema content delivery. Our presentation will benefit audience by analyzing the potential visual discomforts in HDR cinema that may be caused by the severe variations of the adaptation level. We believe that this information will help them to use more efficiently the new technology and deliver the best possible HDR content for cinema.

Take-Aways from this Presentation

The upcoming cinema technologies will support higher peak luminance levels (highlights) as well as higher Full Screen White (FSW) levels than today's technologies. In this work, we study the two most common cases when potential "misuse" of these capabilities may lead to viewers' visual discomfort, given the dim environment of theatre auditoriums. Specifically, we evaluated the luminance levels at which a temporal transition from regular cinema level to brighter levels is considered "too bright" in respect of the size and intensity of the highlights. Further to this experiment, we also evaluated the relationship between the elevated average brightness levels of long sequences and observers' visual discomfort on dim environments. We also attempted to assess the impact of brighter content to the perceived dynamic range in respect of the ambient illumination. We believe that our presentation will be beneficial for the audience since it will inform about capabilities but also risk of upcoming technologies.

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