

IMPROVED HIGH DYNAMIC RANGE VIDEO CODING

BACKGROUND

The images that we watch in a theatre, on TV, on screens and on our tablets are but a pale reflection of what exists in reality or that our visual perception allows. The contrast in a scene is measured by the ratio, called dynamic range, of light intensity values between its brightest and darkest points. While common natural scenes may have a contrast of 1,000,000:1 or more, our visual system allows us to perceive contrasts of roughly 10,000:1, much greater than the available simultaneous contrast range of traditional cameras and screens. For this reason, the capture and display of content with a dynamic range approaching that of real scenes has been a long-term challenge, limiting the ability to reproduce more realistic images. But currently it is not uncommon for state-of-the-art camera sensors to have a dynamic range of 3 or 4 orders of magnitude, therefore matching in theory the range of human visual perception; computer generated images can have an arbitrarily high dynamic range; and recent display technologies have made brighter TV sets available without increasing the luminance of the black level, which has enabled the appearance of HDR (High Dynamic Range) displays.

An HDR system is specified and designed for capturing, processing, and reproducing a scene, conveying the full range of perceptible shadow and highlight detail, with sufficient precision and acceptable artefacts, including sufficient separation of diffuse white and specular highlights and separation of color details, far beyond current SDR (Standard Dynamic Range) video and cinema systems capabilities. HDR technology can provide a never before seen increase in contrast, color and luminance and is lauded in the creative sector as a truly transformative consumer experience: for the cinema and TV industries, HDR represents “the most exciting format to come along since color TV”.

All the possibilities that the HDR format could offer, in terms of revenue and market growth for companies and in terms of improved user experience for the viewer, depend upon the existence of a fully functional HDR ecosystem, a “community of economic agents interacting for the balance of all, in a framework favorable to externalities”, in which professional infrastructure and methodologies allow for the acquisition, post-production, distribution and exhibition of HDR content. But we are currently a long way from such an ecosystem, as stated in very recent reports from several international organizations and standardization bodies, due to open challenges happening at all stages of the production chain, from capture to display.

TECHNOLOGY

HDR images have more contrast, and therefore more information, than SDR images. This means that video compression, already a challenging problem for SDR video, with its eyes increasing resolution and color depth, becomes even more demanding for HDR video. In collaboration with NHK, we have developed and patented a method to improve HDR video compression (this should be the first NHK patent with a university from outside Japan. It produces smaller amount of video coded data with improved image quality compared with other methods standardized for cinema (ST2084) and broadcasting (BT.2100).

ADVANTAGES

The resulting transform is automatic (no need for user-selected parameters) and of extremely low computational complexity, making it a good candidate for real-time applications. It produces images and videos that look natural, without any halos, spurious colors or artifacts.

STATE OF DEVELOPMENT

Prototype software validated in laboratory environment. TRL 3.

INTELLECTUAL PROPERTY

Japanese patent, number 2017-200553, has been filed October 16, 2017

MARKET OPPORTUNITY

It is of interest to camera manufacturers as well as companies specialized in video coding for transmission and recording.

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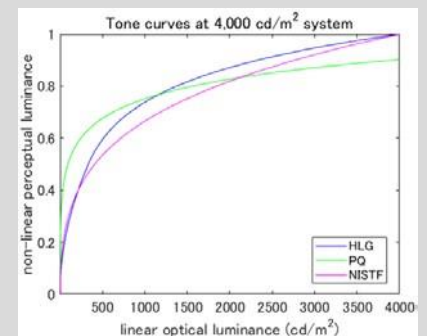


Figure 1

COMMERCIAL OPPORTUNITY

Technology available for licensing

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KEYWORDS

HDR, video compression,
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