CONFERENCIA

"Colour image processing with cinema applications: colour stabilization, HDR creation, and gamut mapping"

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Title: **Colour image processing with cinema applications: colour stabilization, HDR creation, and gamut mapping.**

Abstract: We start the talk by focusing our attention in two crucial but often overlooked observations from the camera imaging pipeline: firstly, that the core of the colour correction chain in a digital camera is simply a multiplication by a 3×3 matrix; secondly, that to colour-match a source image to a reference image we don't need to compute their two colour correction matrices, it is enough to compute the operation that transforms one matrix into the other. From these observations, we will propose a method for colour stabilization of shots of the same scene [1], taken under the same illumination, where one image is chosen as a reference and one or several other images are modified so that their colours match those of the reference. Our approach only requires a set of pixel correspondences, it does not need any information about the cameras used, nor models or specifications or parameter values. There is a wide range of applications of our technique, both for amateur and professional photography and video: colour matching for multi-camera TV broadcasts, colour matching for 3D cinema, colour stabilization for amateur video, etc. Later, we will present an extension of the aforementioned method in order to perform gamma correction from and for multiple images [2]. The expression "from and for" is used as we need more than a single image to obtain the gamma estimation but, at the same time, we recover as many estimates as images are used.

Building up from the previous results, we will show that current methods aiming to create an HDR image from a set of differently exposed LDR images are based on assumptions that were true for film cameras, but that do not hold for digital cameras. Therefore, a new HDR creation method that considers the digital imaging camera pipeline will be pesented [3].

Finally, we will move to the problem of gamut mapping. Gamut mapping is currently a pressing need for cinema and TV, as cinema projector and TV makers are pushing towards displaying wider gamut content (eventually reaching to BT.2020) compared to the current standard (BT.709). We will show how it is possible to modify a perceptually-based variational model that presents three competing terms (an attachment to the image mean, and attachment to the original image, and a contrast modification term) in order to perform gamut reduction and extension by modifying the sign of the contrast modification term [4], [5].

[1] Color Stabilization Along Time and Across Shots of the Same Scene, for One or Several Cameras of Unknown Specifications, Javier Vazquez-Corral, Marcelo Bertalmío IEEE Transactions on Image Processing, 23(10):4564-75, 2014.
[2] Simultaneous blind gamma estimation, Javier Vazquez-Corral, Marcelo Bertalmío, IEEE Signal Processing Letters, 22(9): 1316-20,2015.
[3]The Intrinsic Error of Exposure Fusion for HDR Imaging, and a Way to Reduce it, Raquel Gil Rodríguez, Javier Vazquez-Corral, Marcelo Bertalmío, BMVC, 2015
[4] Gamut mapping in cinematography through Perceptual-based contrast modification, Syed Waqas Zamir, Javier Vazquez-Corral, Marcelo Bertalmío, IEEE Journal on Selected Topics on Signal Processing, 8(3):490-503, 2014
[5] Gamut Extension for Cinema, Syed Waqas Zamir, Javier Vazquez-Corral, Marcelo Bertalmío, IEEE Transactions on Image Processing, 2017

Bio: Javier Vazquez-Corral is a Juan de la Cierva-Incorporación Fellow in image processing and computational vision at the Image Processing for Cinematography Group (IP4EC) of Universitat Pompeu Fabra. He obtained a BsC in Maths from Universitat de Barcelona in 2006, the MsC and the PhD in Computer Science from Universitat Autònoma de Barcelona in 2007 and 2011 respectively under the guidance of Maria Vanrell and Graham Finlayson. His main research area is in computational color. Specifically, he has worked on different problems ranging from color constancy to color stabilization, color characterization, HDR creation, color gamut mapping, image dehazing, and vision color properties such as unique hue prediction and color naming.