

Is it possible to apply colour management technics in Virtual Reality devices?

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INTRODUCTION

Virtual Reality (VR) has witnessed a great development during last years. The improvement of Head Mounted Displays (HMD) allows visual immersive experiences in virtual environments and will have many applications, in both recreational and professional fields.



Oculus CV1



HTC Vive



Oculus Go



Samsung Galaxy Gear



Fig.1 Commercial virtual reality glasses (left) and applications (Up)

Virtual



Real



Fig.2 Comparative images of real and virtual objects from a previous work. JOSA A 35 (4), B130-B135

In a previous work, the authors have stated that the colour is the most significant factor influencing the quality of the virtual reality experience in terms of generation of the virtual image in relation to the original one.

It is time to wonder whether it is possible to make a correct colour management in VR devices and the use of ICC colorimetric profiles.

In this work, we face this issue in a first approach, propose a solution and show the obtained results.

METHODOLOGY

We have defined a custom ICC colour profile for our Oculus Rift CV1 VR device using as display characterization model the classical linear model using a previous non-linear gamma correction.

The measurement instrument employed was a Konica-Minolta CS-2000 tele-spectroradiometer with a spectral resolution of 1 nm.

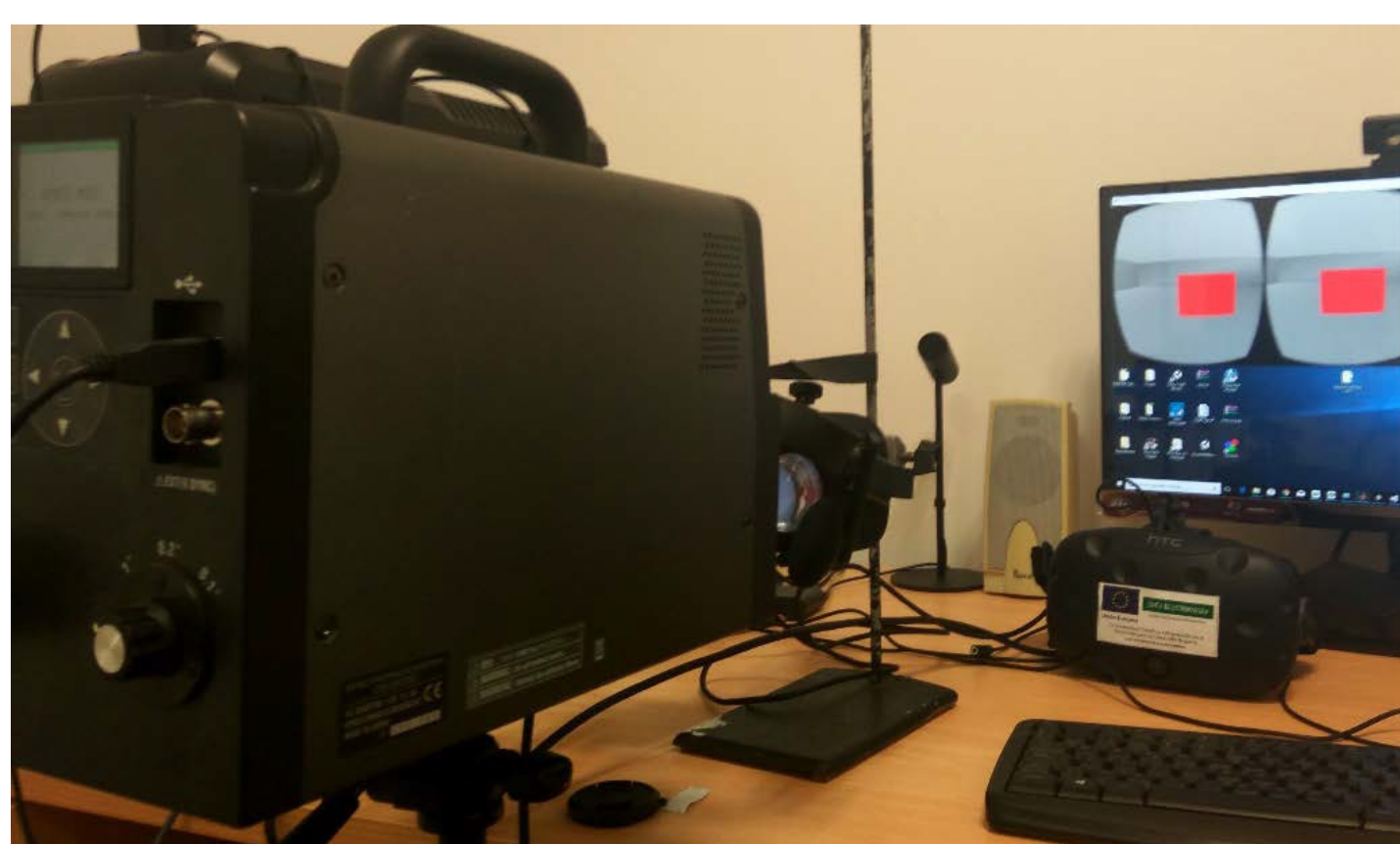


Fig. 3 Experimental Set-up

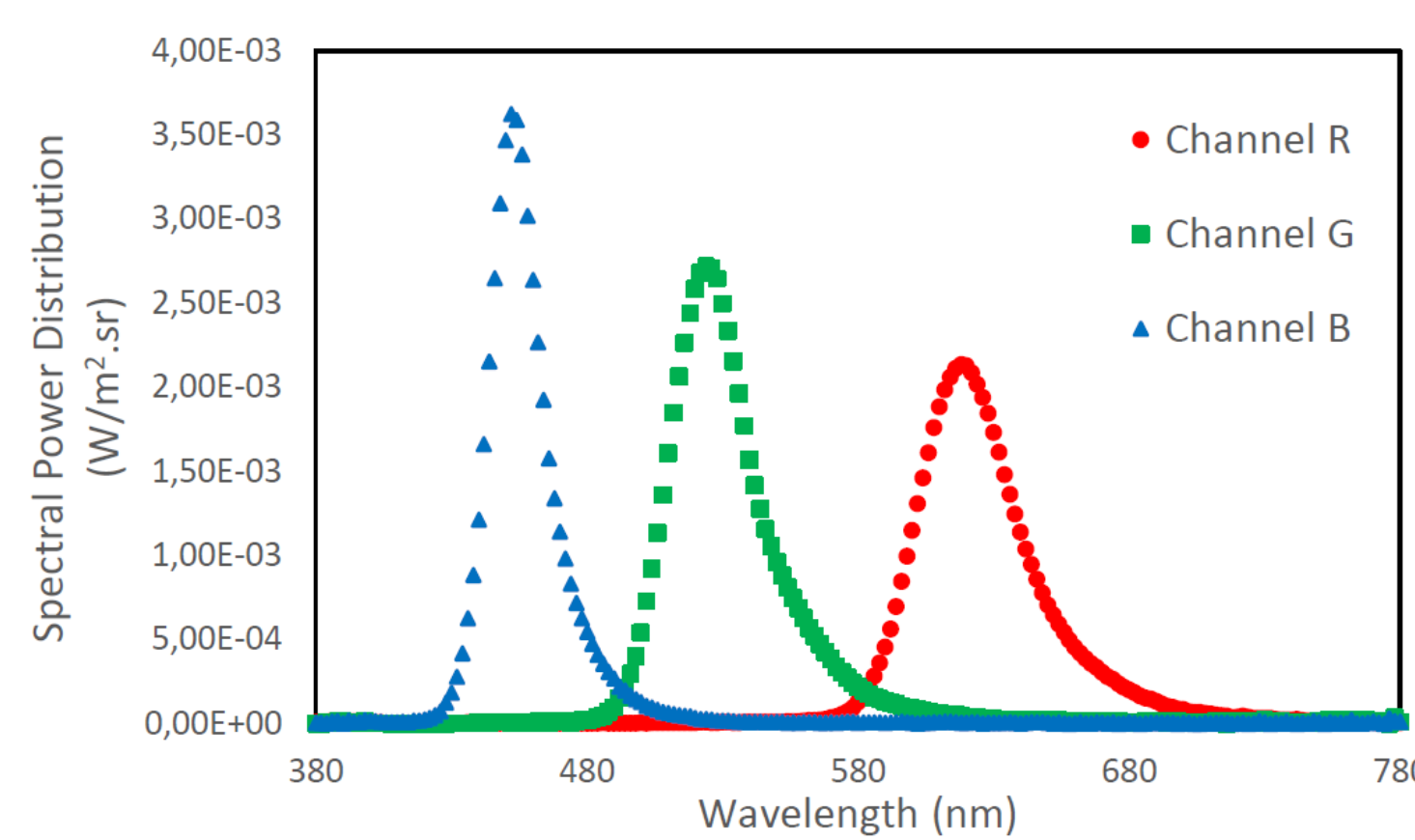


Fig.4 Spectral power distribution of RGB channels at 255 DAC value.

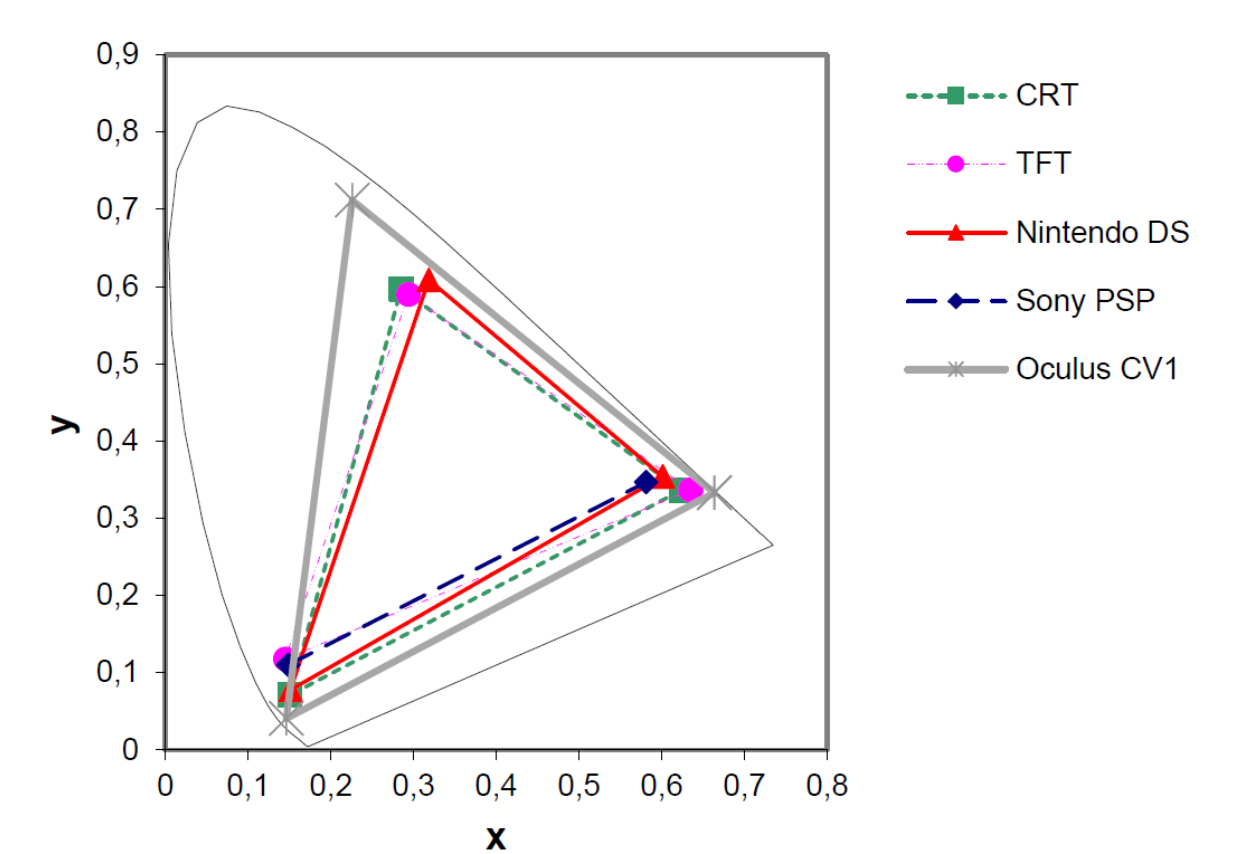


Fig.5 Chromaticity gamut of Oculus CV1 compared with other display devices.

RESULTS

To check the usefulness of the new ICC colour profile, we used a digital image altered the chromaticity coordinates of red and green channel in such a way that if the image is shown in red/orange tone, the system manages the colour in the correct way (fig 6, right). On the other hand, if the appearance is greenish the colour management is absent (fig 6. left).

The results have shown that, in this way, it is possible to apply colour management transformations to colour images in VR devices and obtain a better colour fidelity reproduction.

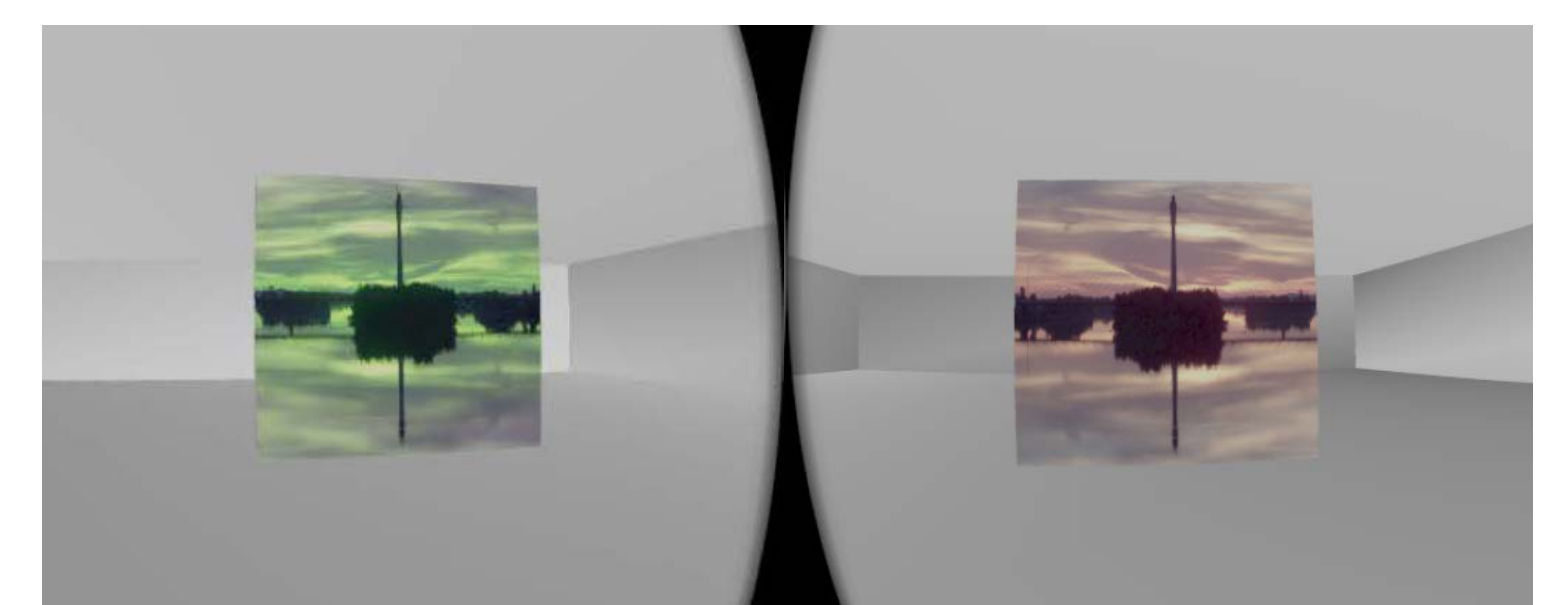


Fig.6 Digital image with colour profile embedded without (left) and with (right) colour management applied.

CONCLUSION

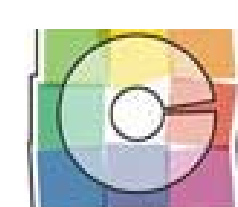
We have made the chromatic characterization of a VR device and have defined a colour transform library and an ICC colour profile. In this way, it is possible to apply colour management transformations to colour images in VR devices and obtain a better colour fidelity reproduction.

Organizzazione/Organisation



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