

HDR versus hyperspectral images for applied colour and lighting research



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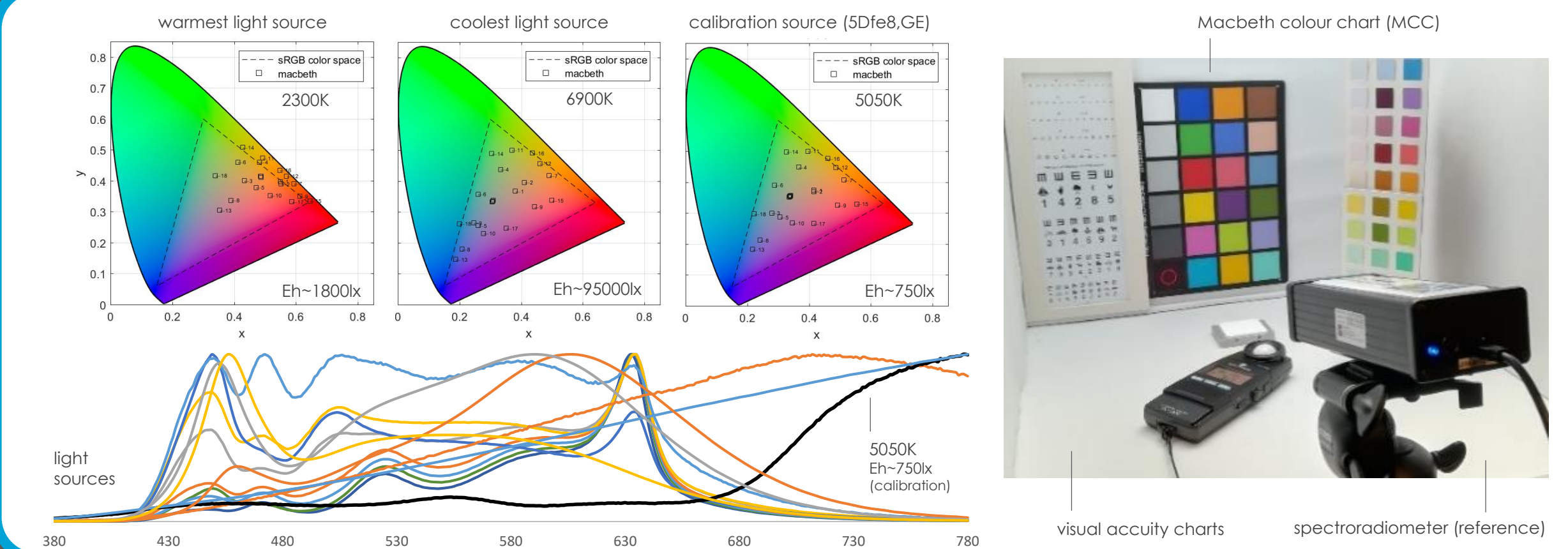
Material

HDR PHOTOGRAPHY	HYPERSPECTRAL PHOTOGRAPHY			SPECTRAL SIMULATION
CANON EOS 5D Mark II + Sigma 8mm F3.5 EX DG ~2k€ +DSLR Remote Pro 5634*3753px (Ø fisheye ~ 3530 px)	Innospec GreenEye ~15k€ binning 2-1 +SiCap-G8 1312 px (y definition) 7 nm (spectral resolution) [355.8;1095.0nm]	Specim-FX10 ~20k€ binning 4-1 +LUMScanner +AIZAtool 1024 px (y definition) 5.5 nm (spectral resolution) [396.0;1004.0nm]	Specim-V10E ~60k€ binning 2-2 +LUMScanner +AIZAtool 2184 px (y definition) 2.9 nm (spectral resolution) [394.6;1007.0nm]	Ocean 2018 ~20k€ XYZ

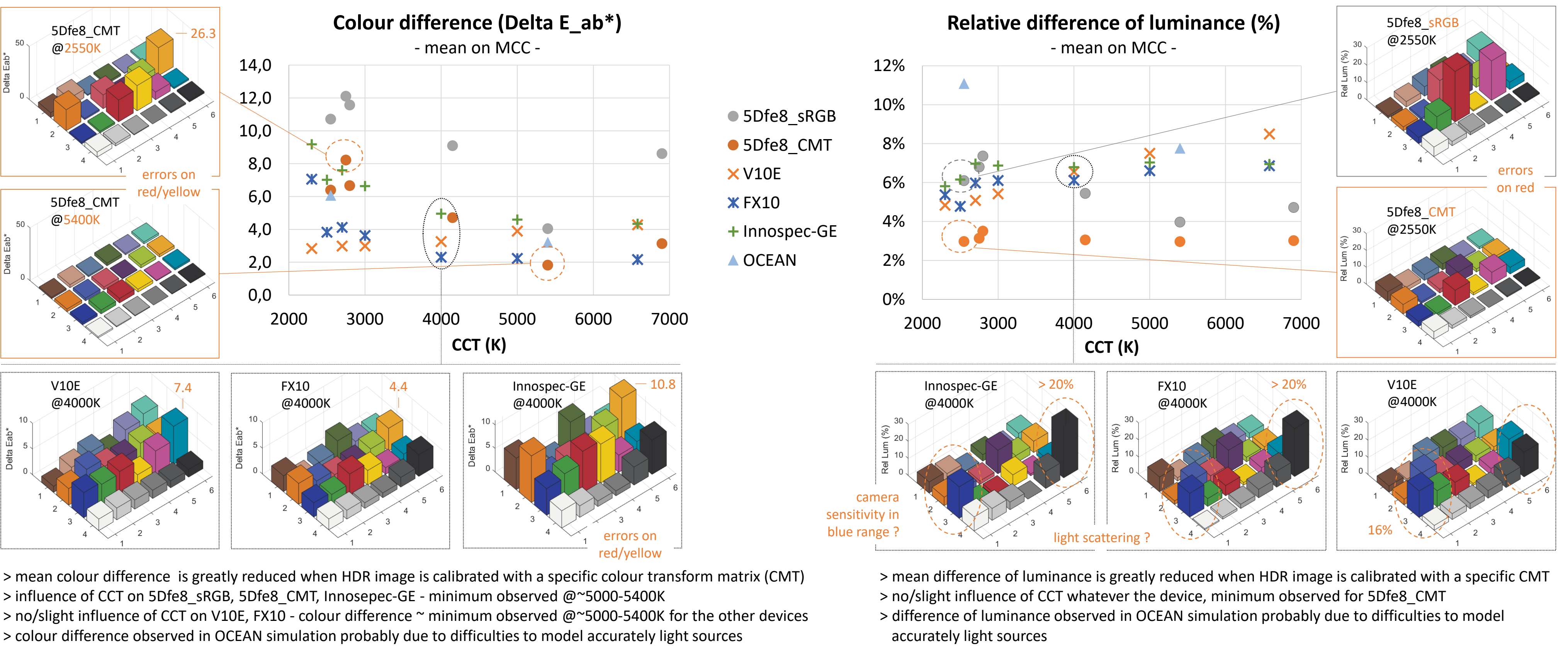
Research question

- > Hyperspectral camera manufacturers claim to produce high definition images while capturing for each pixel spectral information, with an optical resolution equivalent to spot spectroradiometers. Such technology is relevant for lighting and colour research to characterize or predict both indoor and outdoor environments.
- > Our aim is to investigate opportunities and limits of hyperspectral images for studying coloured environments. How faithful is the rendering of scene data on display? To what extent can they be used as visual stimuli in psychophysical experiments?
- > This study quantifies photometric and colorimetric accuracy obtained by three hyperspectral cameras and compares it to HDR images and spectral simulations. Image sharpness is also analysed.

Method



Results | Accuracy



Results | Image quality



Discussion and conclusion

- > Measured colour differences expressed as Delta E_{ab}* are higher than expected (6 CIELAB) but very few literature is available to set acceptable colour differences for complex scenes. Sensitivity for colour differences in complex scenes seem to be reduced compared to typical test set-ups as noted in our first observations, but this needs to be confirmed with further experiments.
- > HDR imaging techniques can be used for measuring luminance and colour in complex scenes lit by sources with CCT between 5000K and 7000K, because chromaticity coordinates are mainly within the colour gamut of the camera. For scenes lit with sources having other CCTs hyperspectral cameras should be preferred.

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