

Study on Image Quality of OLED HDR Displays

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CONTENTS

0 Introduction.....	2
1 Physical Measurements.....	3
2 Visual Experiments	5
2.1 Experimental setup.....	5
2.2 Observers	6
2.3 Test images and video	6
2.4 Image attributes.....	7
2.5 Scoring standards and methods.....	8
2.6 Procedures of visual experiments	9
2.7 Raw data processing method	10
3 Results and Discussions.....	12
3.1 Observer accuracy.....	12
3.2 Subjective evaluation results via LGD processing method	14
3.3 Subjective evaluation results via scale value processing method.....	15
3.4 Discussions based on scale values	16
3.5 Observer comments	21
4 Summary.....	23
APPENDIX.....	24
APPENDIX A An instance of scale value processing method	24
APPENDIX B Detailed image attribute results via LGD method.....	27
APPENDIX C Detailed image attribute results via scale value method	35

0 Introduction

The demand of accurate and pleasant image reproduction for displays has been more and more important in recent years. Being limited by their small dynamic range, however, the usual displays can hardly reproduce the actual luminance of real scenes effectively. In response to the requirement of displaying image contents with higher dynamic range and better luminance accuracy, the high dynamic range (HDR) displays have been developed. Differing from the traditional standard dynamic range (SDR) displays, the HDR displays generally have higher peak brightness and lower minimum luminance level, thus providing a wider dynamic range to reproduce more details of the presented images or videos. To reproduce HDR contents, both HDR signal source and HDR display device are necessary. The former provides the scene's real luminance information when being captured, and the latter uses a device-independent electro-optical transfer function (EOTF), namely perceptual quantizer (PQ), to convert the electric source signal to the optical output signal, producing the same luminance as recorded in the HDR image contents. The previous studies have pointed out that the HDR image contents have obvious advantages over the SDR image contents. On the other hand, the large-size OLED HDR displays have been developed, which can present very low blackness and rather high perceptual contrast. Thereby it is desiderated to investigate and further compare the performances of HDR displays with different coloring technologies as well as the external and internal factors that affect the display quality.

In this project, a series of psychophysical experiments were carried out to evaluate the image quality of three HDR TVs with different luminous mechanisms and panel technologies, and further to discuss how the image attributes and viewing conditions impact the overall preference of the observers for the HDR displays.