



D5.3 REAL-TIME INVERSE TONE-MAPPING IN A REFERENCE ENVIRONMENT



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1 EXECUTIVE SUMMARY

Inverse Tone Mapping (ITM) is the problem of expanding the dynamic range (DR) of a standard DR (SDR) image or video sequence, so that when shown in a HDR display it presents an enhanced contrast and color appearance but at the same time the viewing intent present in the original is respected.

It is a challenging problem because the contrast increase inherent to the ITM process may make more visible the noise and quantization artifacts that are present in the SDR source (often of lower bit depth than the HDR output), diffuse white objects have to be distinguished from highlights even though they have similar numerical values in the SDR image, and real-time implementations must reach a compromise between speed and quality of the results.

In this document we report our initial work on developing a real-time ITM algorithm. After reviewing the literature, we extend to graded HDR content the study on natural image statistics that we recently performed on a standard HDR database. We observe a linear relationship, close to the identity, between the median luminance of the graded HDR content and its tone-mapped, SDR counterpart. From this result we decide to test a simple ITM method consisting of a power-law transform, where the fixed exponent gamma is computed as to ensure that the median luminance value of the HDR result is the same as that of the SDR source image. After testing several modifications for this approach we conclude that it's not satisfactory in general, as the quality of the results depends heavily on the value distribution of the source material. Next we propose an alternative method, that combines the inverse of the TM algorithm of Cyriac et al. (2016) with the preservation of the median luminance as mentioned above. The results of this latter approach are very promising.