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Which tone-mapping is the best? A comparative study of tone-mapping perceived quality

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High-dynamic-range (HDR) imaging refers to the methods designed to increase the brightness dynamic range present in standard digital imaging techniques. This increase is achieved by taking the same picture under different exposure values and mapping the intensity levels into a single image by way of a tone-mapping operator (TMO). Currently, there is no agreement on how to evaluate the quality of different TMOs. In this work we psychophysically evaluate 15 different TMOs obtaining rankings based on the perceived properties of the resulting tone-mapped images. We performed two different experiments on a CRT calibrated display using 10 subjects: (1) a study of the internal relationships between grey-levels and (2) a pairwise comparison of the resulting 15 tone-mapped images. In (1) observers internally matched the grey-levels to a reference inside the tone-mapped images and in the real scene. In (2) observers performed a pairwise comparison of the tone-mapped images alongside the real scene. We obtained two rankings of the TMOs according their performance. In (1) the best algorithm was ICAM by J.Kuang et al (2007) and in (2) the best algorithm was a TMO by Krawczyk et al (2005). Our results also show no correlation between these two rankings. [CAP and XO are supported by grant TIN2010-21771-C02-01 from the Spanish Ministry of Science.]