

Rendering Non-Pictorial (Scientific) High Dynamic Range Images

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Abstract

In recent years, the graphics community is seeing an increasing demand for the capture and usage of high-dynamic-range (HDR) images. Since the production of high dynamic range imagery is not solely the domain of the visualization of real life or computer generated scenes, novel techniques are also required for imagery captured from non-visual sources such as remote sensing, medical imaging, astronomical imaging, etc. This project proposes to integrate the techniques used for the display of high dynamic range pictorial imagery for the practical visualization of non-pictorial (scientific) imagery for data mining an interpretation.

Nine algorithms were utilized to overcome the problem associated with rendering the high dynamic range image data to low dynamic range display device, and the results were evaluated using a psychophysical experiment. Two paired-comparison experiments and a target detection experiment were performed. Paired-comparison results indicate that the Zone System algorithm performs the best on average and the Local Color Correction method performs the worst. The results show that the performance of different encoding schemes depend on the type of data being visualized. The correlation between the preference and scientific usefulness judgments ($R^2 = 0.31$) demonstrates that observers tend to use different criteria when judging the scientific usefulness versus image preference. Preliminary result of the target detection experiment illustrates that the detectability of targets in an image is greatly influenced by the rendering algorithm due to the inherent differences in tone mapping among the algorithms.

Author Biography

Sung Ho Park is currently a second year M.S. student in Color Science program at MCSL, RIT. His current research interests lie in color visualization and rendering. He will receive his M.S. in May 2004. For his Master's thesis, he has been working with Prof. Ethan Montag on rendering non-pictorial HDR images. He received his B.S. in Printing System Management also from RIT.