High Dynamic Range displays and how they might apply to simulation

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ABSTRACT

The latest development in the consumer and professional display market is the High Dynamic Range, a.k.a. HDR, displays and image capture. Can we apply these new displays into the simulation environment to take advantage of high volume manufacturing and lower cost systems? The image quality of flight simulators are getting closer to reality by improving the visual system resolution and responsiveness. However, the dynamic range of many real-world environments exceeds the capabilities of current visual system and the brightness and color of displayed images do not meet such requirements. HDR simulator systems using high contrast projectors by applying HDR standards of the display industry can help us in both the visible and NVG stimulation areas. HDR standard (SMPTE ST2084) can represent the dynamic range (0.005Nits-10,000Nits) which is similar to the human eye. By using a HDR projector with a sequential contrast ratio close to the human eye sight, the simulator will be capable to reproduce realistic scenes such as extreme day light, pitch black night situations and near infra-red for NVGs and will enable the pilot's eye to respond naturally in flight training. This paper will explain the PQ Electro Optic Transfer Function and look at various work done with high dynamic range systems.

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Rod Sterling is Chief Engineer, of JVC Technology Center, JVCKENWOOD USA Corporation, in Long Beach, California. He received his MS in Electrical Engineering, Applied Physics from the University of California, San Diego. He currently supports the efforts in ultra-high resolution displays, Reference Series and Visualization Series projectors and their applications, with focus on Simulation, High Dynamic Range, Visualization, Home Theatre, and Stereoscopic displays. He has over 32 years of experience in the display area and over 24 years in Simulation and Electronic/Digital Cinema. He is the author of over 25 journal articles, 12 patents and 2 screen credits. He is an active member of SID, IEEE, SPIE and SMPTE.

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