An Ultrahigh-Speed, High-Sensitivity, Portable CCD Color Camera


Recent advances in the ability of cameras to capture fast-moving phenomena that cannot be seen clearly with the naked eye, and to represent these in slow-motion video, have attracted interest not only for scientific applications but also for broadcast applications. Many conventional high-speed cameras incorporate a CMOS imaging device, which can read out signal charges at high speeds by using an X-Y matrix switching scheme. However, there are limitations with CMOS imaging devices. These devices require very intense lighting to obtain video with a good signal-noise (S/N) ratio during high-speed shooting with a short exposure time. This requirement makes it difficult to shoot high-speed images for relay broadcast of nighttime sports events at facilities with inadequate on-site lighting. This paper discusses the development of the first ever ultrahigh-speed high-sensitivity CCD with 300,000 pixels - four fold increase over the previous version, as well as the development of a single-chip portable color camera mounted with this CCD. This camera is capable of ultrahigh-speed video recording at up to 1,000,000 frames/sec, with about ten times the sensitivity of standard high-speed cameras. It has enabled an entirely new style of presentation for sports broadcasts and science programs.

A YC-separation-type projector: High dynamic range with double modulation

Journal of the SID 16/2, 2008, pp. 383-391
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A n experimental projector that features double modulation to obtain high-resolution (4096×2160 pixels) and high-dynamic-range images has been developed. Although a conventional projector contains three modulators for red, green, and blue and outputs light after combining the modulated light from these three sources, our projector has an additional modulator for luminance that modulates the combined RGB modulated light. It can display high-resolution color images by combining three low-resolution panels for chrominance modulation and one high-resolution panel for luminance modulation. In addition, the dynamic range is dramatically improved because the double-modulation scheme minimizes black levels in projected images. The projector demonstrates an extremely high dynamic range of 1.1 million to 1 and 10-bit tone reproduction.