

LuminTec LED Light Line Illumination System for High Performance Scanners

White Paper
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Introduction:

This white paper details nextScan's LED illumination system called LuminTec, which effectively increases the real resolution by nearly 2 times in the scanning direction without increasing image file size.

During the scanning process for high performance scanners, the source image is moving during the time that each scan line is being captured. This movement causes a blurring of adjacent scan lines and results in less than optimum image resolution. This reduction in image resolution can be as much as $\frac{1}{2}$ in the scanning axis because the source image is moving and therefore exposes two scan lines during the capture time of one. See Figure 1 and 2.

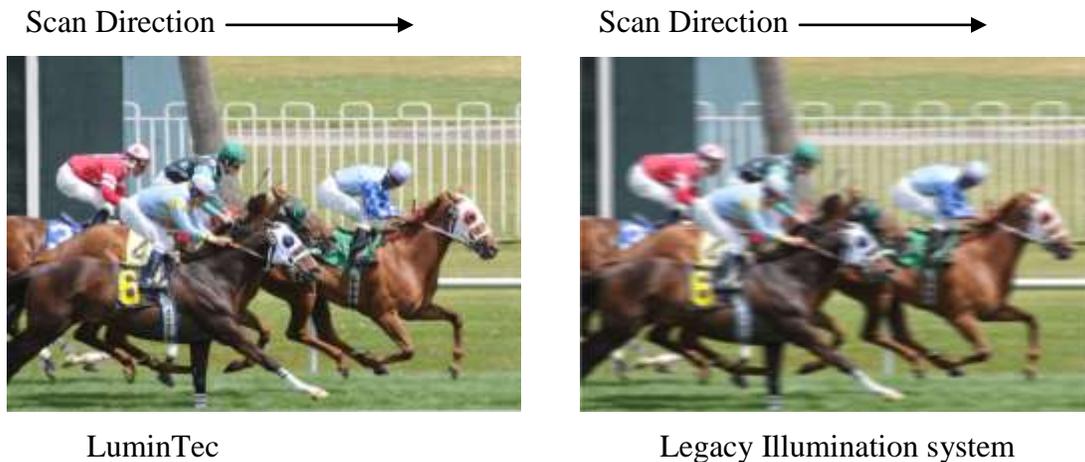


Figure 1

In Figure 1, notice that blurring does not occur in the vertical direction only horizontally due to the scanning direction of the source image. The fence only blurs horizontally, but that degrades the overall image. With LuminTec the effects of the scanning movement are eliminated.

Strobe Solution:

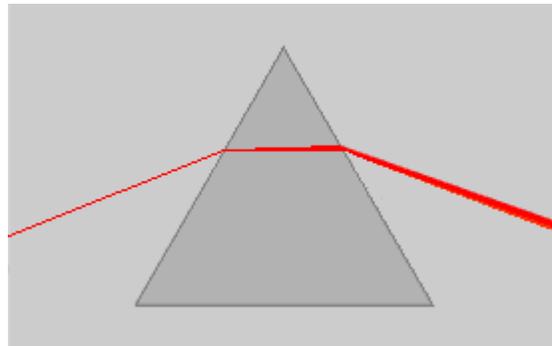
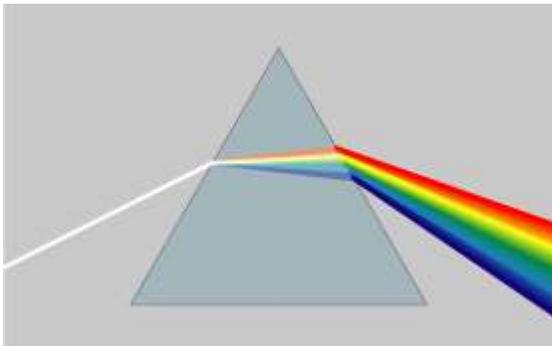
This movement and resultant blurring was resolved in the photographic process by having a strobe light synchronized to the shutter of a camera to provide sufficient light for a very short exposure interval to “freeze” the moving object. Similarly, we can “Freeze” each scan line and increase our resolution by a factor of nearly two, by using the same strobe effect.

The scanning process for all existing high-performance Scanners utilizes a “Line Scan” CCD or CMOS imaging array. These Arrays have a single line of photo-sites (pixels) and consequently scan line-by-line for a predetermined exposure time for each line.

Enter the LED:

Enter the modern high power LED. LED's have the ability to be turned on and off in sub-microsecond intervals, which effectively strobe each scan line freezing it's motion. Additionally they can be driven at 10 times their normal power levels for short intervals, as long as the average power consumption does not exceed their rating. The LED's have no infrared emissions, and as a result do not cause the CCD sensor to have pixel-to-pixel bleeding due to heating of the photo sites.

Additionally, the LED light produced by LuminTec is nearly monochromatic, meaning it contains only a single color. This helps the lens resolution because color correction deficiencies of the lens will not matter. Think of a prism and how it breaks up white light into the colors of the rainbow. This same effect happens in all lenses that have to deal with "white" light, which contains all visible colors. This spreading of the colors contained in white light causes individual pixels to be blurry. In the example below, a single pixel of white light enters the prism and is spread into it component colors which may cover several pixels. This is especially true of Microfilm media with its high reduction ratio and small pixel spot size.



NextScan uses high quality optics and LuminTec makes our lenses perform even better.

The End Benefit

In the end, the nextScan LuminTec Light Line yields the following benefits:

- Almost 2X the resolution in the scanning direction
- No Infrared emissions to blind the CCD/CMOS Imager
- 100,000 hour Mean Time Between Failure (MTBF) vs. 2000 hours for incandescent systems
- 1/10 the power consumption and thus heat generation of incandescent illumination systems, resulting in higher MTBF of the scanner as a whole.

LuminTec™ is a registered trademark of nextScan, Inc.

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