CRT Image Filter

Abstract

We present a function that takes a low-resolution image (256px x 224px) intended for cathode ray tube-based television sets and upscales it by a factor of five for display on a high-definition, 1080p format screen, emulating the look and feel of a CRT display in the process. The upscaling converts each pixel in the original image into a 5x5 grid. Each 5x5 grid is then processed to resemble a single RGB phosphor and a blur effect is applied to emulate light bleeding between phosphors.
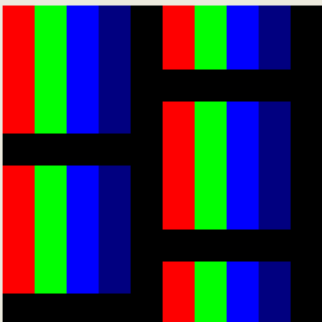
Details

The initial upscaling uses a nearest-neighbor algorithm to retain the hard edges of individual pixels. The image is then inverted and the inverted RGB values subtracted from a phosphor pattern to create the initial CRT phosphor array effect.

A copy of the phosphor array is blurred using a box blur technique, then blended over the original phosphor array using a "screen" blend.

Left: CRT Filter output with input image inset at scale

Phosphor Pattern Detail

Output Detail

The phosphor array is constructed using a repeatable phosphor pattern. Each "phosphor" in the pattern is a 5x5 representation of a CRT phosphor.

On close inspection of the output image the original "phosphors" are visible. Here the red and green bands can be clearly seen in the character's yellow belt, just as one would expect on a CRT display.