Screening

Artifex offers two high-performance screening technologies, Well Tempered Screening (WTS) and Even Toned Screening (ETS).

Even Toned Screening

Even Toned Screening controls undesirable halftone patterns and textures, a form of error diffusion screening optimized for inkjet printers, using a technique known as Output-Dependent Feedback Screening.

Exceptional features of error diffusion screening include total freedom from moire, as well as unparalleled fidelity in reproducing fine detail. These features have helped ensure error diffusion's dominant role in halftoning for inkjet printers.   This high quality screening technique adds output-dependent feedback to the conventional error diffusion halftone, improving these halftones significantly.

with Even Toned Screening   with Floyd-Steinberg

``Wormy'' Textures in Highlights and Shadows

Error diffusion halftones are plagued by a ``wormy'' texture in highlights and shadows. This undesirable effect is caused by limitations in the logic used by error diffusion to place dots. With Even Toned Screening, the visual texture of highlight and shadow tones are made more uniform, eliminating the wormy textures that can occur with conventional error diffusion halftones.   This screening technique is effectively identical to placing each halftone dot in the center of a circle and packing the circles tightly together. The resulting texture appears very homogeneous, and is visually pleasing to the eye.

While Even Toned Screening can be applied to both highlight and shadow dots, on inkjet printers only the highlights cause visually noticeable patterns, because of ink spread.   Thus, applying the output-dependent feedback to highlight textures only, can speed processing.

``Tearing'' Adjacent to High-Contrast Areas

With the smooth highlight areas created with Even Toned Screening, ``tearing'' is also avoided. Tearing refers to a screening artifact where the halftone dots drop out next to high-contrast areas, creating a hole or "tear" in the halftone image.

This ``tearing'' effect is particularly severe for mixed pages containing images and line art or colored text. The use of Even Toned Screening ensures excellent results for all types of source images.

Availability

Even Toned Screening is available in two forms. First, it is a complete error diffusion algorithm using a tuned version of Floyd-Steinberg to achieve excellent smoothness for all tone values. Second, it is available as a modification to existing error diffusion algorithms, placing the highlight (and optionally shadow) dots more smoothly while leaving the midtones unchanged. The second option is desirable when work has already been done tuning an error diffusion algorithm to a particular device.

The final result is a halftone with exceptionally smooth highlight regions, free of "worming" and "tearing," with modest computational cost. The speed of Even Toned Screening is within a factor of two of simple error diffusion techniques such as basic Floyd-Steinberg, the earliest and most well-known error diffusion technique.

We are happy to provide sample output comparing Even Toned Screening with Epson's own high-quality screening, tuned for Epson printers. The differences are conspicuous and stunning.

ETS "Green Screen"

Green Screen is a second-order FM screening that uses variable dot placement and noise. This not only eliminates moiré, but also improves the reproduction of flesh tones. In addition Green Screen gives excellent rendition of fine detail and produces smooth tints and vignettes with no noise

Exceptional reproduction of fine detail
Smooth multi-color vignettes with no noise
No visible dot structure in skin tones
Increased color gamut gives greater visual impact and wider range of process colors
Screened type is sharp and legible
Flat tints are smooth

First-order Stochastic Screening

First-order stochastic screening uses fixed spot sizes, and adjusts their frequency and proximity as needed for midtones, highlights, and shadows. Also known as FM (frequency modulated) screening, it prevents moire and rosette patterns and allows textiles, metal products, flesh-tones, and complex images to render with amazing detail and clarity.

Second-order Stochastic Screening

A less desirable trait of first-order FM screening is graininess. Green Screen corrects this deficiency by using a fixed spot size only in the highlights and shadows while allowing the midtones to vary slightly. Green Screen produces visual density by increasing both the size and frequency of spots, enabling better tonal control and smoother, more natural reproduction.

Unlike other stochastic technologies, Green Screen does not use tiles for dot placement, which can cause repetition artifacts. Instead, Green Screen uses error diffusion placement. Additionally, advanced algorithms virtually eliminate the worm-like patterns inherent to diffusion screening. The implementation of Green Screen is in standard C, with additional SSE2 (Pentium 4) optimizations to achieve blazing performance on modern platforms.

Argyll Color Management System^{TM}

Argyll is an ICC compatible color management system. It supports accurate ICC profile creation for scanners, RGB or CMYK printers, film recorders and display monitors. Spectral sample data is supported, allowing a selection of illuminants observer types, and paper fluorescent whitener additive compensation. Profiles can also incorporate source specific gamut mappings for perceptual and saturation intents. Gamut mapping and profile linking uses the CIECAM02 appearance model, a unique gamut mapping algorithm, and a wide selection of rendering intents. It also includes code for the fastest portable 8 bit raster color conversion engine available anywhere, as well as support for fast, fully accurate 16 bit conversion. Device color gamuts can also be viewed and compared using a VRML viewer. Argyll also includes a general purpose ICC profile format access library, icclib, and a general purpose CGATS file format I/O library.

Awards

In partnership with RIPit, Even Toned Screening won the 2003 "PDF Shootout" at Seybold San Francisco for best quality PDF output, besting far more expensive solutions.