Efficient Magnification of Bi-Level Textures —Additional Documentation—

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Figure 1: Comparison of techniques: standard trilinear filtering (64×128 texels, 11 KB, upper left), our method (same resolution and memory size, lower left), DXT1-compressed trilinear filtered texture (128×256 texels, 21 KB, upper right), high-resolution texture (1024×2048 texels, 2731 KB, lower right).

Figure 3: Comparison of techniques: standard trilinear filtering (128×128 texels, 21 KB, upper left), our method (same resolution and memory size, lower left), DXT1-compressed trilinear filtered texture (256×256 texels, 43 KB, upper right), high-resolution texture (1024×1024 texels, 1365 KB, lower right).

Figure 2: Different distance metrics for the optimization lead to different shapes: square of difference between positions of intersections (d_l, upper left); square of difference between angles at intersections (d_a, upper right); the mixed measure $d_a + 0.01 d_l/(\alpha^2 + 0.01)$, which we employ (lower left; for the definition of α see Figure 5). For comparison, the high-resolution bitmap is shown in the lower right.

Figure 4: Optimized texture as displayed (left) and before thresholding (right). Note the dots generated to sharpen the corners of the typeface characters.

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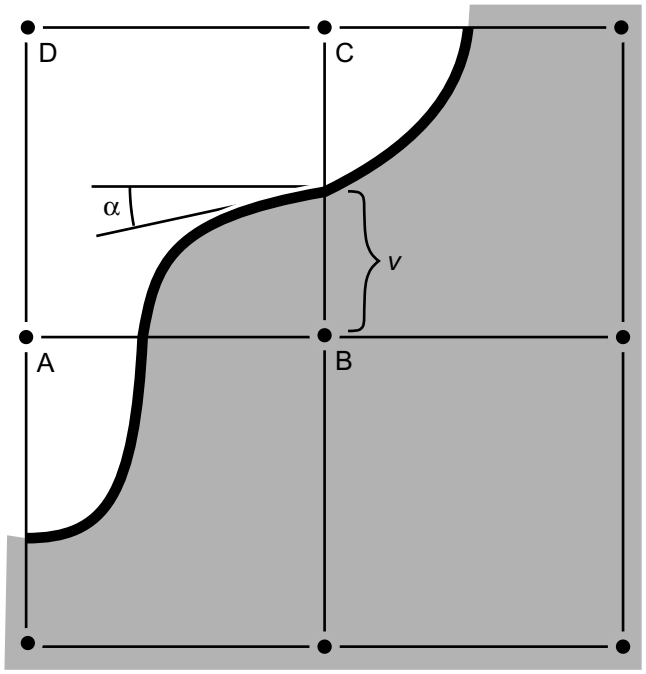

Figure 5: Thresholding the result of bilinear interpolation leads to curved shapes. The locations and angles of the intersections of the outline with the grid of texel centers can be computed from the texture's grayscale values a, b, c, $d \in \{0,\ldots,255\}$ at the adjacent texels. In the shown situation, $v = \frac{b-127.5}{b-c}$ and $\tan\alpha = \frac{(a-127.5)(c-127.5)-(b-127.5)(d-127.5)}{(b-c)^2}$. Similar equations apply to the intersections along other edges.

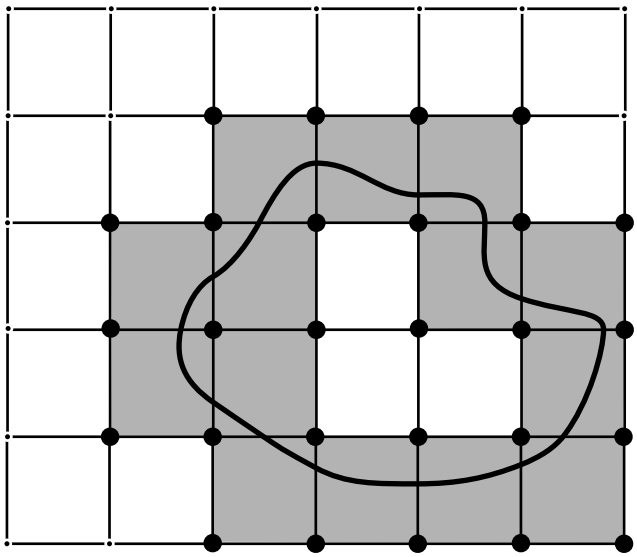

Figure 6: We examine the intersections of an outline with the edges of the grid formed by the centers of the texels. If the outline intersects n edges (in the example shown, $n = 14$), it can be characterized by the n locations of the intersections and the n corresponding angles. Typically, nearly $2n$ adjacent texels influence this curve (27 in the example).

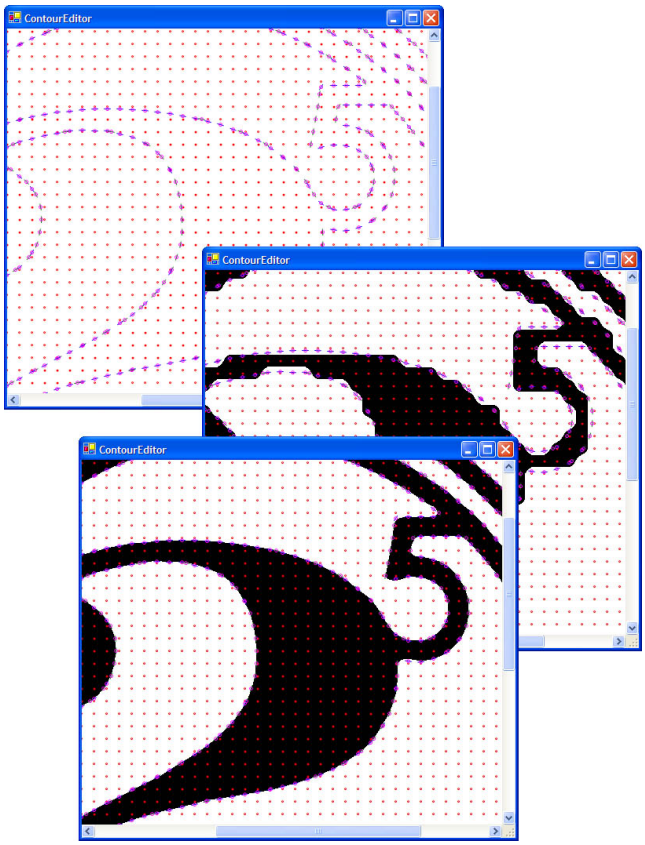

Figure 7: Screen shots of the authoring application: positions and angles of the intersections automatically extracted from a high-resolution bitmap (top); thresholded result after initialization (middle); result of automatic optimization (bottom).