Jacobson, J.E., Sejnowski, T.J.
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Abstract

We present a novel method for automatically enhancing (or diminishing) the legibility of typefaces without altering grapheme size or energy. Just as caricature generators enhance those features which most distinguish a targeted face from the average face, we generate an enhanced grapheme by exaggerating those aspects which distinguish that grapheme from an average grapheme. More particularly, we model letter perception with a multidimensional activation-space with each dimension measuring the activity of a unit jointly tuned to a spatial frequency and an orientation. Every grapheme corresponds to a point in the space, and the point is determined by the grapheme's 2D Fourier power spectrum modified to reflect the gain filters found to mediate letter identification in critical band-masking studies (Solomon and Pelli 1994; Majaj et.al.2002). In this activation-space, points corresponding to frequently confused graphemes are nearby, while those corresponding to graphemes which are easily distinguished are further apart. To enhance the legibility of a single grapheme, say, the numeral ‘2’, we produce a new grapheme which corresponds to an activation-space point roughly along the trajectory passing through the points corresponding to the average numeral and ‘2’, but further from the average numeral than ‘2’. Thus, our enhanced ‘2’ differs from the other numerals along the same lines as ‘2’, but more-so. The graphemes this process generates are grey scaled, and so, even if for convenience's sake, we “cookie-cut” an enhanced grapheme so it has the same shape as the original, the new grapheme has a different spatial-frequency profile. To enhance the legibility of a font, we enhance each grapheme in it, and consequently spread the activation-space points associated with the font's graphemes apart, and succeed in generating fonts that are more discriminable in noise.

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