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Supplemental Results for "Apparent Greyscale: A Simple and Fast Conversion to Perceptually Accurate Images and Video"

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(a) Original (b) Y

(c) Our G (d) Our G' $p = 1$ $k = \{0.2, 0.2, 0.2\}$

Figure 1: *In Claude Monet's* Les coquelicots, *our image makes poppies that pop out like they do in the original, and separates the woman's blue dress from the green field, without enhancing the border between the trees and skyline.*

(a) Original (b) Y (c) Our G' $p = 0.5$ $k = \{0.6, 0.5, 0.4, 0.3\}$

Figure 2: *The red flower stands out from the background.*

(a) Original (b) Y (c) Our G' $p = 0.75$ $k = \{0.4, 0.4, 0.3, 0.2\}$

Figure 3: *The very bright blue background does not map to black.*

(a) Original (b) Y (c) Our G' $p = 0.2$ $k = \{0.2, 0.2, 0.2\}$

Figure 4: *Painting by Willem Dekooning. Our greyscale more accurately portrays the high contrast reds. For instance, the small red triangle in the top right corner is more salient.*

(a) Original (b) Y (c) Our G' $p = 0.2$ $k = \{0.8, 0.6\}$

Figure 5: *A painting whose flowers advance more than in the Gimp greyscale version. Source www.vischeck.com.*

Figure 6: *Consistent colours: A 'bouquet' of Impatiens, which our approach orders without conflicts or rearrangements. Parameters are constant at* $p = 0.5$ $k = \{0.5, 0.5, 0\}$.

(a) Original (b) Y (c) Our G

Figure 7: *The effect of parameter p as shown on Claude Monet's* Impression: soleil levant, 1873 *(see following figure).*

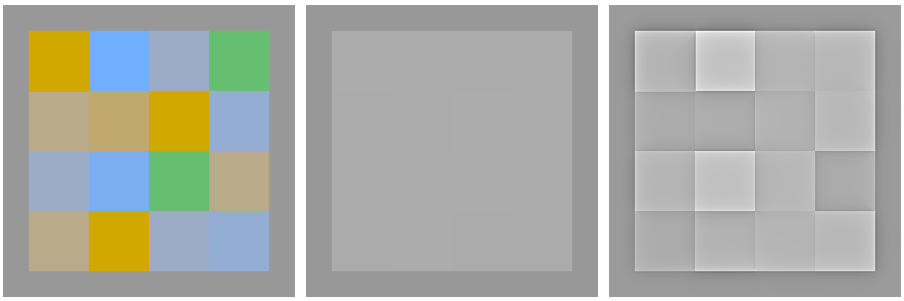
(a) Our G', $p = 0.1$ (b) Our G', $p = 0.2$ (c) Our G', $p = 0.3$

(d) Our G', $p = 0.4$ (e) Our G', $p = 0.5$ (f) Our G', $p = 0.6$

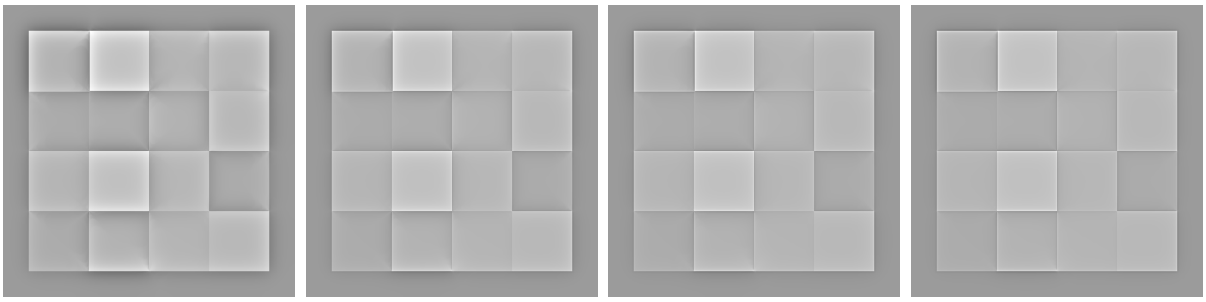
(g) Our G', $p = 0.7$ (h) Our G', $p = 0.8$ (i) Our G', $p = 0.9$

(j) Our G', $p = 1$

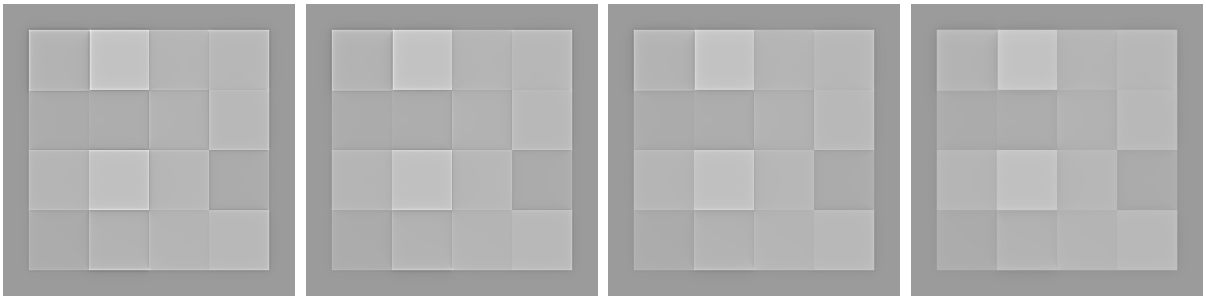
Figure 8: *The effect of parameter p as shown on Claude Monet's* Impression: soleil levant, 1873. *Notice that the boat and other luminance discontinuities are not sharpened. Only chromatic contrasts appear, mainly in the sky and water reflections. Parameter k is constant at* $k = \{0.2, 0.5, 0.6, 0.4\}$.



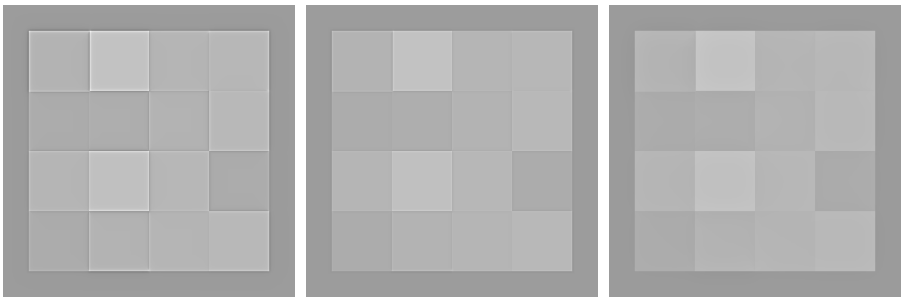
(a) Original (b) Y (c) Our G' $p = 0.35$, $k = \{1, 1, 1, 0.6\}$



(d) Our G' $p = 0.5$, $k = \{1, 1, 1, 0.6\}$ (e) Our G' $p = 0.5$, $k = \{1, 0.6, 0.6, 0.3\}$ (f) Our G' $p = 0.5$, $k = \{1, 0.5, 0.4, 0.3\}$ (g) Our G' $p = 0.5$, $k = \{1, 0.4, 0.3, 0.2\}$



(h) Our G' $p = 0.5$, $k = \{1, 0.3, 0.2, 0.1\}$ (i) Our G' $p = 0.5$, $k = \{0.8, 0.3, 0.2, 0.1\}$ (j) Our G' $p = 0.5$, $k = \{0.6, 0.3, 0.2, 0.1\}$ (k) Our G' $p = 0.5$, $k = \{0.3, 0.3, 0.2, 0.1\}$



(l) Our G' $p = 0.5$, $k = \{1, 0.2, 0.1, 0\}$ (m) Our G' $p = 0.5$, $k = \{0.4, 0, 0, 0\}$ (n) Our G' $p = 0.5$, $k = \{0.1, 0.1, 0.1, 0.1\}$

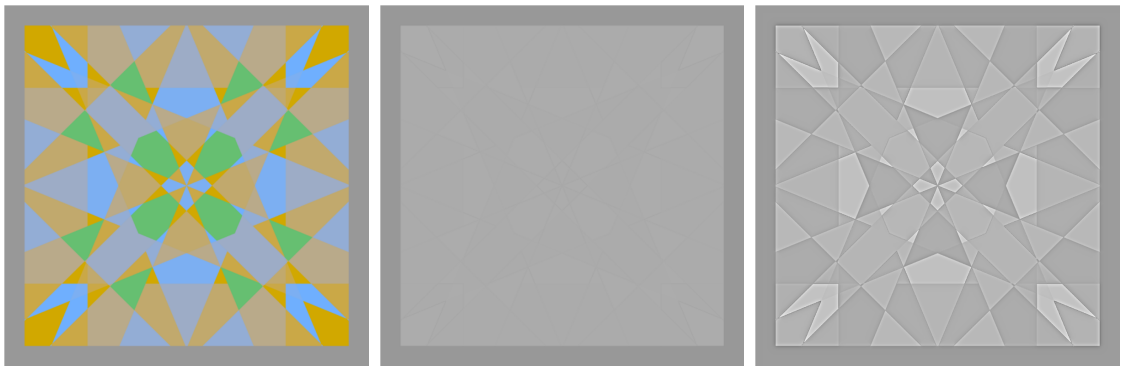
Figure 9: *The effect of parameter k on an isoluminant pattern. The top row shows the effect of reducing the impact of lower-frequency bands, resulting in reduced spatial extent of the enhancement. The middle row shows a reduction of the highest-frequencies and the bottom row shows an overall weakening of the enhancement which reduces discriminability.*

(a) Original (b) Y (c) Our G' $p = 0.55$, $k = \{1, 0.2, 0.2, 0\}$

Figure 10: *Rasche's isoluminant blocks are discriminated using our approach, and their ordering is consistent with the original colour ordering.*

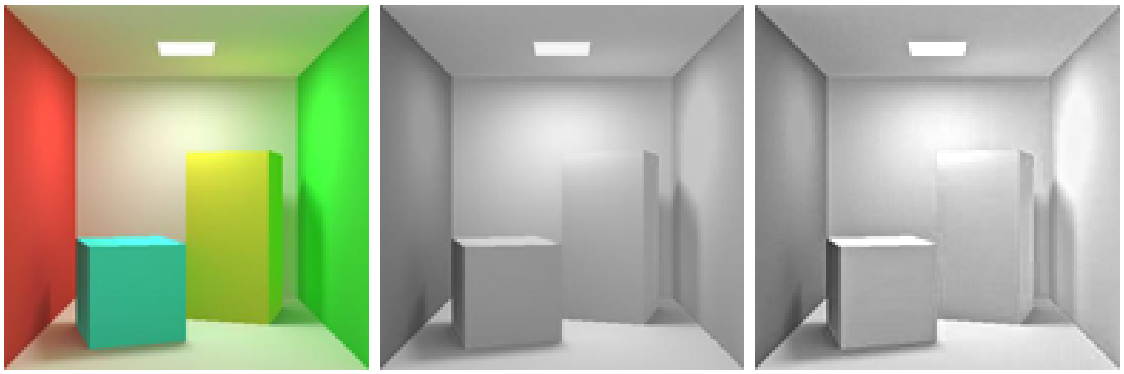
(a) Original (b) Y (c) Our G' $p = 0.7$, $k = \{0.6, 0.5, 0\}$

Figure 11: *Rasche's red berries are mapped to a lighter grey than with Gimp. Berries are lightened and in the top right corner, they reappear.*



(a) Original (b) Y (c) Our G' $p = 0.5$, $k = \{1, 0.75, 0.5\}$

Figure 12: *Neumann et al.'s test image with complete isoluminance.*

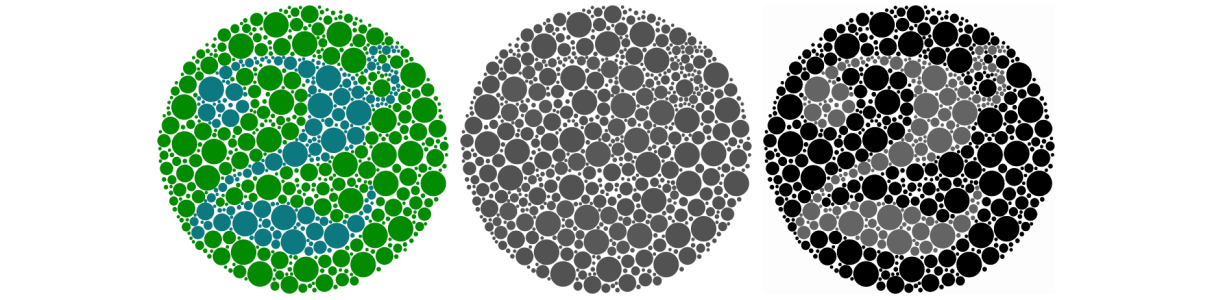


(a) Original (b) Y (c) Our G' $p = 0.5$, $k = \{0.3, 0.3, 0, 0\}$

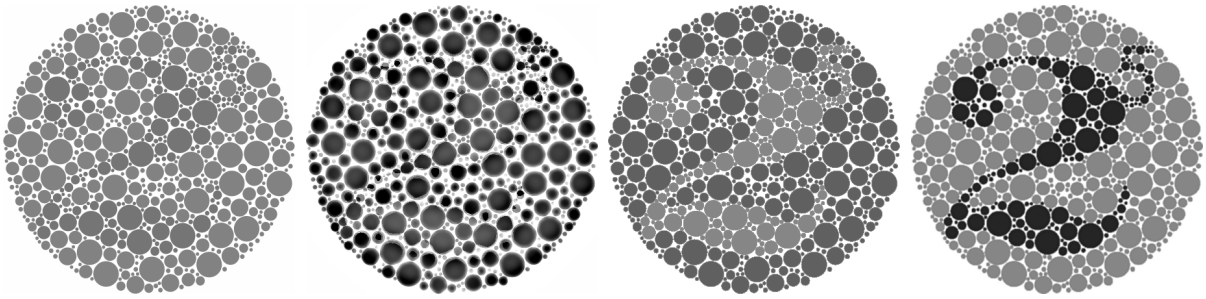
Figure 13: *Gooch's isoluminant test image of some recognizable boxes.*

(a) Original (b) Y (c) Our G' $p = 0.8$, $k = \{0.4, 0.4\}$

Figure 14: *In Gooch's map, we let the enhancement effect be visible in the water because it has a pleasing look. The original colours are nearly fluorescent looking, but this may not appear in print.*



(a) Original (b) Y (c) Rasche



(d) Our G (e) Our G' $p = 1$ $k = \{0,0,1,1\}$ (f) Y with histogram equalization (g) Our G with histogram equalization

Figure 15: *We now present a case where our local approach to contrast restoration can not attain the same discriminability level as Rasche. On this specialty image for testing daltonism (a), Rasche (c) reach their goal of an exaggerated discriminability. While we find perceptually accurate colour order and difference (d), we are limited because the colours to be discriminated are separated by white boundaries. In such special cases and high desired discriminability, we can use our global mapping and then apply a contrast stretch or automatic histogram equalization, thus keeping the benefit of colour ordering. Notice that compared to a Gimp greyscale with automatic histogram equalization (f), ours is more discriminable (g), and that our greyscale order is more perceptually accurate because of its basis in colour studies.*

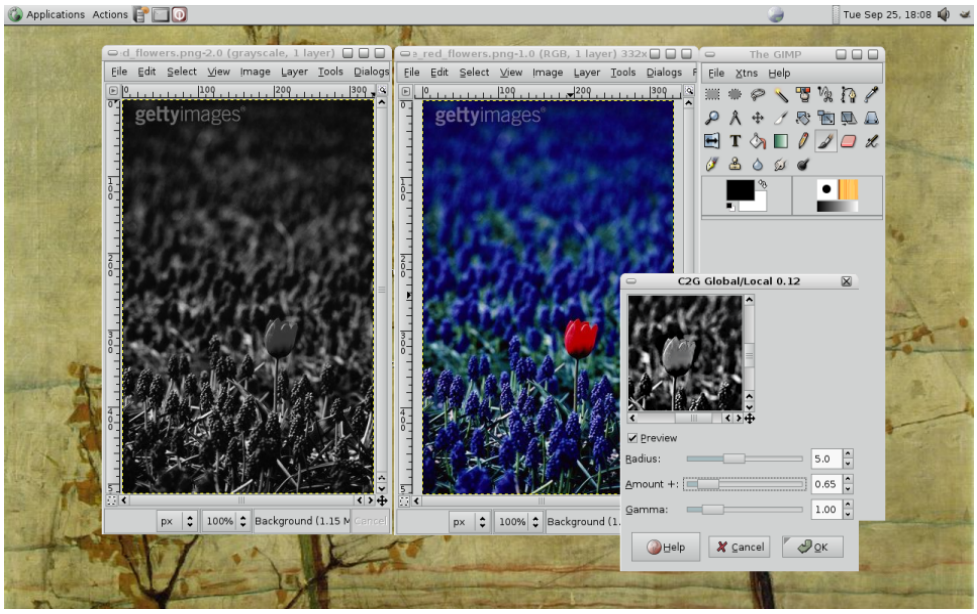


Figure 16: *For quick testing, we implemented a single-scale version of our approach as a Gimp plug-in, with an adjustable filter size.*