

A new type of the optimized Fraser-Wilcox illusion in a 3D-like 2D image characterized by highlight and shade

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Motion illusions can be classified into two categories. One is that the image really moves, while the other is that the image is stationary but appears to move. The Fraser-Wilcox illusion (Fraser and Wilcox, 1979; Faubert and Herbert, 1999; Naor-Raz and Sekuler, 2000) is a typical one of the latter. Kitaoka and Ashida (2003) optimized the configuration of this illusion (also see Murakami et al., 2006). Moreover, Kitaoka (2007) classified the optimized Fraser-Wilcox illusion into four types (Types I, IIa, IIb, and III) on the pictorial level (also see Chi et al., 2008; Kitaoka, 2008) (Figure 1).

	dark to light	light to dark	
Type I Luminance-gradient type			observed in the peripheral vision illusory motion
Type IIa Asymmetric line type			observed in the peripheral vision and the near-peripheral vision illusory motion
Type IIb Three-field edge type			observed in the peripheral vision and the near-peripheral vision illusory motion
Type III Low-contrast edge type			observed in the central vision and the near-peripheral vision illusory motion
	Blue and/or red enhance illusion	Yellow and/or green enhance illusion	

Figure 1. Classification of the optimized Fraser-Wilcox illusion proposed by Kitaoka (2007). Arrows show the direction of illusory motion. There are four types, each of which has two subtypes, *i.e.* dark-to-light and light-to-dark.

In addition to these types, I recently discovered a novel pictorial representation of the optimized Fraser-Wilcox illusion. I here introduce it as a new type or Type IV. Figure 2 shows its

basic images and their luminance profiles. Figure 3 shows an illusion design made from it.

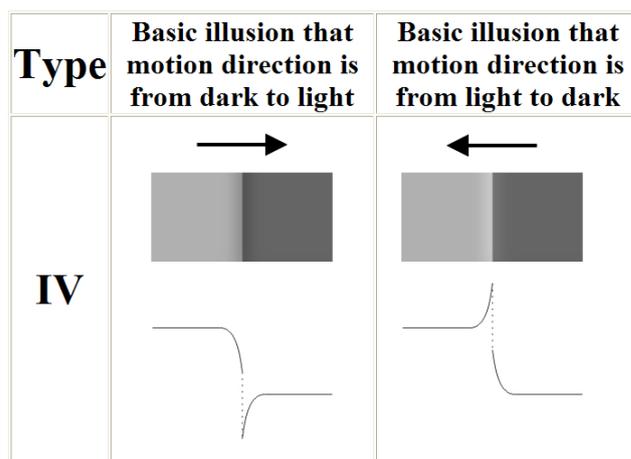


Figure 2. A new type or Type IV of the optimized Fraser-Wilcox illusion. Arrows show the direction of illusory motion. The luminance profiles of the two basic images are depicted below them.

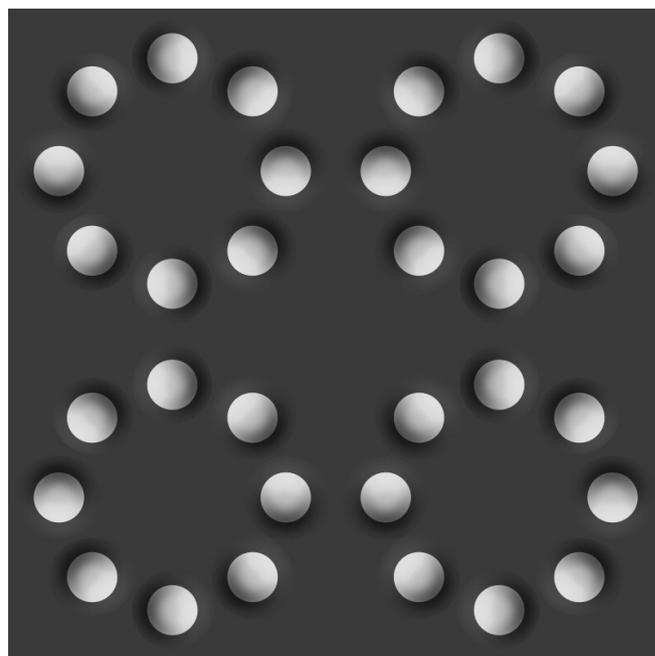


Figure 3. An illusion design made from Type IV. The upper-left and lower-right rings appear to rotate counterclockwise, while the rest clockwise.

Illusion images made from Type IV gives a 3D-like impression because the luminance profiles of this type just resemble the highlight and shade of convex objects, as shown in Figure 4.

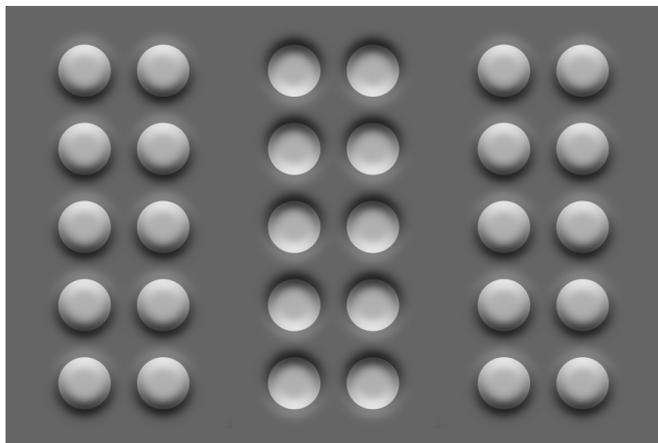


Figure 4. The middle two columns appear to move upward while the rest appear to be stationary or move downward. Each circle appears to be convex.

In addition, Figure 4 reminds us of the shape-from-shading illusion (Ramachandran, 1988) (Figure 5), in which observers see concave appearance, too. Moreover, Figure 5 does not show such a strong motion illusion as Figure 4. To examine these discrepancy might lead us to a deep understanding of the relationship between the 3D-like configuration and anomalous motion illusion.

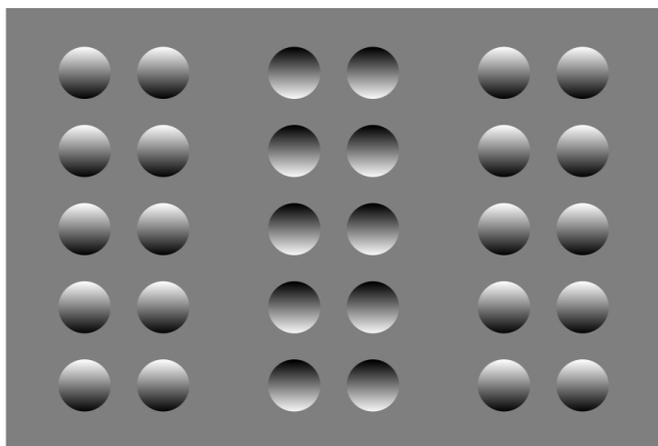


Figure 5. The shape-from-shading illusion. The middle two columns sometimes appear to be concave while the rest appear to be convex.

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