

Length illusion on Benham's top

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Abstract

Benham's top is known as the disk that observer perceives apparent color when it is spinning [1]. However, apparent color is not the focus of this study.

Our finding is that perceived length of the line segment is clearly enlarged only at the white-to-black transition on the white sector. When the disk is spinning, observers perceive that the front edge of black line segment at white-to-black transitions is elongated frontward.

In order to consider the perceptual mechanism, we examined length illusion in two ways; line segment length (Exp. 1) and endpoint location (Exp. 2). We employed real rotating disks instead of electronic displays in order to avoid the artifacts induced by frame refresh. The stimulus was rotated at 40 rpm (flicker frequency at 2Hz) in order to suppress blur as much as possible. Exp. 1 was magnitude estimation task by using static stimuli for comparison, and Exp. 2 was alignment task by using other rotating marks outside the disk. In both experiments, observers kept their gaze fixed in the middle of the disk, while directing their attention towards the line segment. Stimuli were employed three factors: line style (block, stripe), position of the line (rear, mid, front), and background color of the line (white, black).

Large difference in the results between Exps. 1 and 2 was observed only in the "rear / white-background" condition. Results of Exp. 1 showed that the line length was perceived clearly elongated in the "rear / white-back ground" condition ($\times 1.4$, Fig. 1A). And results of Exp. 2 showed that endpoint location was mostly correct at all positions. In order to obtain the length of a line segment, the locations of two endpoints should be given before. So, experiments show that the "line segment length (higher perceptual stage)" is perceived falsely in a particular case (Fig. 1B(a)) whereas the "endpoint alignment (lower perceptual stage)" is perceived mostly correct (Fig. 1B(b)). Therefore, we suggest that (1) this illusion occurs at a relatively high perceptual stage; length or shape not location, and (2) this phenomenon might indicate some visual system characteristic necessary for daily life.

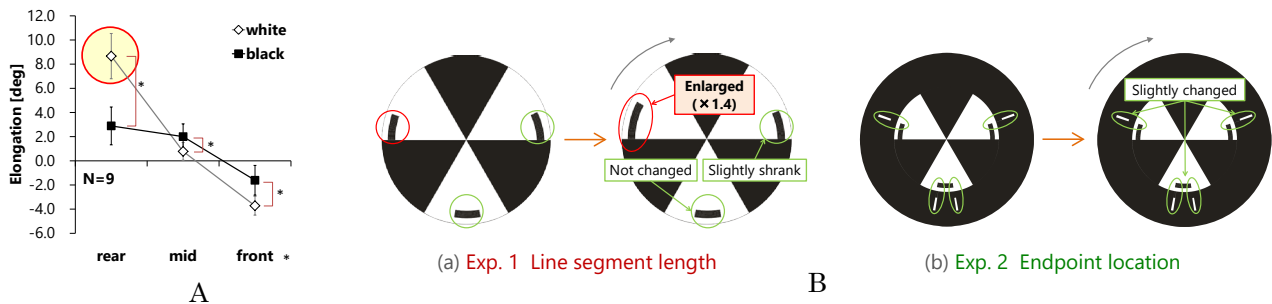


Figure. 1 Figures used in the poster.

References

1. C. von Campenhausen and J. Schramme, "100 years of Benham's top in colour science", Perception, vol.24, pp. 695-717, 1995.

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