Introduction

- There are three aspects of the illusion. 1. Illusory depth, 2. Illusory lightness, 3. Illusory contour
- We measure these three aspects and investigate the differences in the variable configurations of the figures.
- The DISC model (Differentiation Integration for Surface Completion, Kogo et al., 2010) explains the illusory lightness based on the interaction between depth perception and lightness perception.
- Are these interactions between the three aspects?

Experiment 1: depth measurement

Results and conclusions

- The illusion depth perception is measured in the constant-stimulus paradigm, by comparing it with the depth given by stereo disparity (SD) in the non-illusory figures (2AFC).
- The control experiment with the concentric circles (C, D) give steeper depth perception than the standard Kanizsa figures (A, B).
- The control experiment with the concentric circles (C, D) give slightly deeper perception than the figures with contrast (A, B).
- There are no differences between the standard Kanizsa figures and the figures with the concentric circles (A vs B, C vs D).

Experiment 2: lightness nulling

Results and conclusions

- The strength of illusory lightness is measured by the lightness nulling method (Kanizsa, 1967; Spillmann et al., 1984).
- The control experiment with the concentric circles (D, E) give stronger illusory lightness perception than the standard Kanizsa figures (A, B).
- The control experiment with the concentric circles show shallower slopes in the psychometric function.
- The influence of the illusory lightness on the depth perception is very small (B vs A, D vs C).
- Stereo disparity added to the illusory figure does not add up linearly in the depth perception (the red plots vs the blue plots).

Experiment 3: contour positions

Results and conclusions

- The air localization paradigm (Quaia & Kellman, 2005) is applied to the illusory and non-illusory figures.
- The figures (A, B, C, D) give better performance (sharper slopes in the psychometric function) than the non-illusory figures (E, F).
- The variation figures with zero net contrast (C, D) give slightly poorer performance than the figures with contrast (A, B).
- There are no differences between the standard Kanizsa figures and the figures with the concentric circles (A vs B, C vs D).

Experiment 4 depth influence on lightness

Results and conclusions

- The influence of depth perception on lightness perception is measured in the constant-stimulus paradigm, by giving stereo disparity (SD) to the central region and comparing the lightness with the background (2AFC).
- In the non-illusory figures, adding stereo disparity caused an increase of the perceived lightness.
- In the illusory figures, the increase of the perceived lightness was not observed.
- Stereo disparity to the central region, the perceived illusory lightness increases in the non-illusory figure.
- This effect is not present in the illusory (standard Kanizsa) figure.

Conclusion

- The strengths of the illusory depth, the illusory lightness, and the position of the illusory contours were measured in the Kanizsa variation figures.
- The strength of the depth perception depends on the pattern within the pacman area (the figures with the concentric circles give stronger depth perception than the standard Kanizsa figures).
- The influence of the illusory lightness on the depth perception is small.
- The summation of the stereo disparity based depth perception and the occlusion based depth perception is non-linear.
- The illusory lightness perception also depends on the pattern within the pacman area (the figures with the circular figures give stronger lightness perception than the standard Kanizsa figures).
- The perceived position of the illusory contour is slightly inward relative to the position where the straight contours of the inducers are aligned.
- By adding stereo disparity to the central region, the perceived illusory lightness increases in the non-illusory figure.

Reference


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