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Con-fusing contours & pieces of glass

Rob van Lier [a,*], Tessa C.J. de Wit [b], Arno Koning [c]

[a] *Nijmegen Institute for Cognition and Information (NICI), Radboud University Nijmegen, P.O. Box 9104, NL-6500 HE Nijmegen, The Netherlands*
[b] *Radboud University Medical Centre, The Netherlands*
[c] *University of Leuven, Belgium*

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Abstract

We present a new illusory display in which illusory contours are misaligned with physical contours. In these displays, illusory Kanizsa squares, induced by the so-called pacmen, are positioned on top of a background grid of bars. The misalignment of the illusory contours with respect to physical contours of the grid of bars induces an overall 'restless' appearance and evokes the impression that parts of the grid within the illusory square are shifted. To test this impression, we created stimuli in which illusory squares were superimposed on a grid at different positions, where the grid could consist of either straight bars or indented bars. After briefly flashing these stimuli, observers reported indentations of the background grid for those cases in which physical and illusory contours were misaligned. In a control condition, the pacmen were replaced by crosses (not inducing an illusory square) at the same positions; as expected much less illusory shifts were reported in this condition. In a second experiment, we further tested the direction of the perceived shifts, revealing similar trends as in the first experiment and a consistent result with respect to the reported direction of the shifts. We explore and discuss possible underlying mechanisms with regard to our illusory display.

PsycINFO classification: 2323

Keywords: Perceptual organization; Illusory contours; Modal completion; Amodal completion; Misalignment

* Corresponding author. Tel.: +31 24 361 56 98.
E-mail address: r.vanlier@nici.kun.nl (R. van Lier).
URLs: http://www.nici.ru.nl/People/LiervanRJ/index.html, http://www.nici.ru.nl/~Robvl (R. van Lier).

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1. Introduction

Albert Michotte, to whom this special issue is dedicated, was well aware of the notion that stimulus properties and perceptual properties refer to different matters. The very first sentence in Michotte, Thinès, and Crabbé (1964, p. 5) provides a fine synopsis of that idea:

> "Il est banal de rappeler que lorsqu'on soumet des sujets à l'action d'un système complexe de stimulations, ils mentionnent dans leurs réponses certaines particularités, certains éléments constitutifs des structures perceptives qui contrairement à d'autres, ne répondent à aucune excitation locale, mais dont la présence est déterminée par l'ensemble des stimulations." ("It is a well-known fact that when subjects are exposed to the action of a complex system of stimuli they mention in their responses certain details, certain elements contributing to the perceptual structure, which, unlike others, do not correspond to any local stimulation but whose presence is determined by the stimulus system as a whole"; translation in Thinès, Costall, & Butterworth, 1991, p. 140).

The above statement fits in perfectly with the discoveries of the Gestalt psychologists of the previous century that strongly inspired and guided the work of Michotte. Nowadays, the "filling-in" ability of the visual system to which Michotte refers to, still intrigues many researchers. The present study deals with the basic observation that perceived contours do not necessarily have to be physically present in a stimulus. More specifically, contours are sometimes inferred or completed by the visual system even when there are no actual luminance differences. The so-called Kanizsa square (e.g., Kanizsa, 1955, 1979) is perhaps one of the best known examples of a pattern that induces illusory contours (see Fig. 1). The cut-out sectors of the four disks in Fig. 1 are positioned such that an additional illusory square appears, enclosed by illusory contours between the cut-out sectors. These illusory contours have a vivid phenomenological presence, as if they are evoked by real luminance differences. Note that one may interpret this figure also as a square that partly occludes four complete disks. The interpreted occluded parts of the disks, however, do not have the same phenomenological presence as the illusory contours. Following the phenomenological difference between these two types of completion, Michotte et al. (1964) termed these completions modal and amodal, respectively. Both phenomena have been investigated extensively during the last decades on a variety of issues (see for various examples in this special issue: Bertamini & Hulleman, 2006; Fulvio & Singh, 2006).

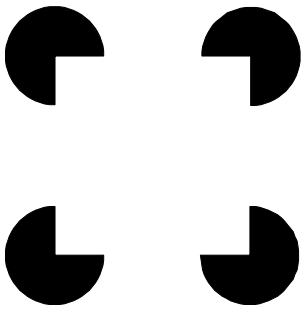

Fig. 1. The Kanizsa square.