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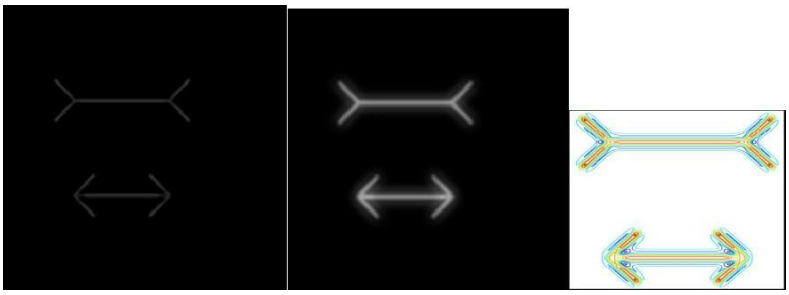
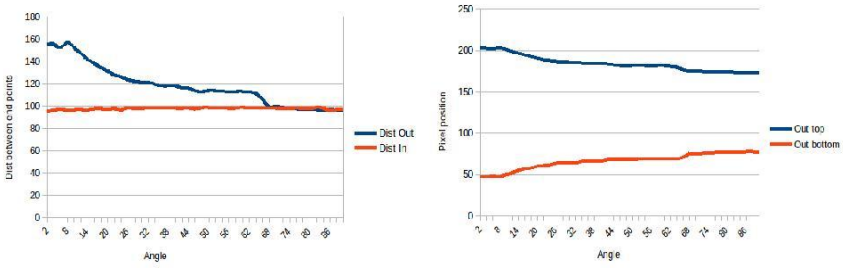
Abstract. *Introduction* Geometric illusions like Muller-Lyer have been studied thoroughly for several years. Kawabata [1] used a mathematical model based on perceptual image field to find the distance which basically is a threshold based function to find perceived length of a line in the Muller-Lyer illusion. We propose to take this study further by using the same model of perceptual field with other bio-inspired filters to explain the illusion and understand the possible mechanism of cognizing the geometry of visual space. Further explored is the relevance of attributes making up the illusion like angle of arrow and the length of line. *Methodology* The perceptual image field of the illusory stimulus is found by convoluting a non-Classical Receptive Field (nCRF) based Gaussian filter [2, 3] on the image. Finding a contour plot of this image, we get artefacts indicating the endpoint of the perceived line. These artefacts are figured out via a threshold based method. The stimulus, filtered image and its perceptual field is shown in Fig. 1. The circular artefacts have been used to find the perceived length of a line. This method is repeated on a number of variants of the illusion with arrow angle in range of 0^0 to 180^0. The perceived length is then measured between the two artefacts to find the relevance of angle with perceived length. *Results* The application of nCRF based filter clearly enhances the distance between the artefacts.



(a) (b) (c)

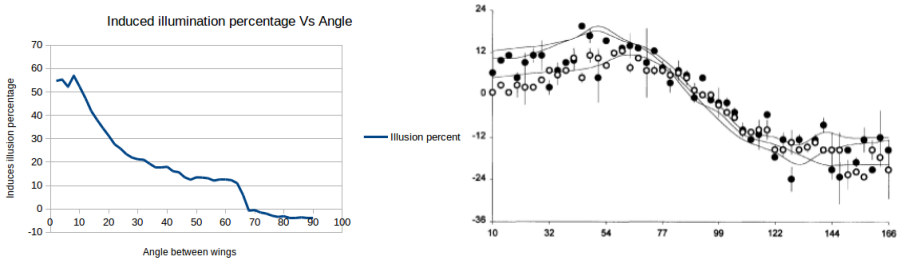
Fig 1. (a) Muller Lyer Illusion (b) nCRF filtered image (c) contour plot or perceptual plane representation

Kawabata [1] in his study did not provide any perceptual length difference figure. In our case the perceptual length difference between both the lines is found to be approximately 30% of the line



(a) (b)

Fig. 2 (a) Plot for perceived length between artefacts vs arrow angle (b) plot for position of artefact and arrow angle



(a) (b)

Fig. 3 (a) Plot for induced illusion vs arrow angle using proposed method (b) plot for induced illusion vs arrow angle found experimentally [4]

length whereas the use of DoG based Gaussian filter [1] shows a difference approximately 20%. The application of the proposed method on a variance of arrow angles yields a plot as given in Fig. 2. *Conclusion* The results shows that the nCRF based filters which are modelling the extended classical receptive fields of retinal ganglion cell [3], can explain the illusion through perceptual plane method better than the DoG based filters [1]. Comparison [4] with induced illusion for psychophysical experimental data is shown in Figure 3.

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