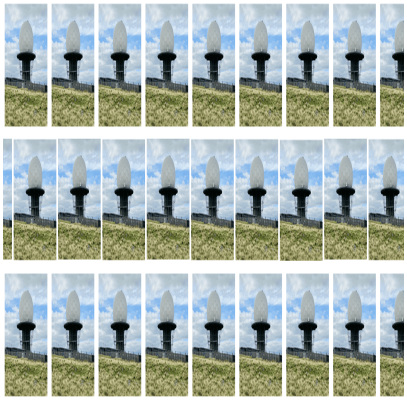


What ever happened to autostereograms?

Description

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I recall the craze in the 1990s for *Magic Eye* posters and books. People would gaze and squint at these multicoloured, seemingly random, patterns to discern 3d images of dolphins, elephants, temples, and spaceships. The method of display was a variation on what I experienced as a child, as I gazed at my bedroom wallpaper that at times seemed to be on a different plane to the walls. Our chain link fence presented a similar disruption to depth perception.

I have created the featured image above to illustrate the principle of autostereogrammetry. In the middle row the images are closer together. If you allow each eye to attend to adjacent images so that images overlay one another (in a kind of â??double visionâ?•) then the angle at which the eyes converge while inspecting the middle row will be smaller than for the top and bottom rows. This disparity contributes strongly to depth perception. The middle row will appear to stand out as if on a plane closer than the others to your face.

Depth maps

The presentation of full 3d imagery with just a single image requires computer manipulation of patterns of pixels that repeat across the plane of the image. The process involves a depth map, which is a grey scale pixel image of a 3d object, such as a car. This information is mapped onto the repeated pattern. Pixels on adjacent repeats in the pattern are adjusted slightly according to the information on the depth map. The variable convergence effect provides the depth cues, and we see the 3d shape.

At the time of their popularity these images reminded us of the remarkable capacity of the human visual system to take in details (pixels) presented to each eye from the same source and to match them so as to signal sufficient depth to present a 3d illusion.

The techniques assume full visual acuity of course. Thereâ??s no colouring; the repeated patterns drape across the surface of the 3d model. You see ghosts and echoes within the imagery, and if you allow your eyes to lock onto repeating patterns that are not directly adjacent then the 3d imagery fragments and multiplies. As with HMDs and 3d cinema, itâ??s not possible to simulate the way the human eye adjusts focus according to depth cues. Thereâ??s no parallax either. You canâ??t see

around the virtual 3d objects by moving your head.

Those of us involved in computer graphics had trouble identifying roles for autostereogrammetry techniques, especially in architecture. They donâ??t seem to offer glasses-free 3d cinema, though a clever YouTube music video of the Young Rival group shows the musicians moving in 3d animation through visual white noise. There are many other animated examples, e.g. by Roma N: https://www.youtube.com/watch?v=IZpsbQMQFBs.

Cerebral cryptography

The idea of pictures hidden within seeming randomness is alluring as a form of steganography, and scholars have experimented with such imagery as a way of achieving so-called â??cerebral cryptography,â?• cryptography that incorporates the capability of the human cognitive system to decode secret messages unaided.

Bibliography

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- Ninio, Jacques. 2007. The science and craft of autostereograms. *Spatial Vision*, (21) 1-2, 185â??200.
- Zou, Zhengxia, Tianyang Shi, Yi Yuan, and Zhenwei Shi. 2020. NeuralMagicEye: Learning to See and Understand the Scene Behind an Autostereogram. *arXiv e-prints*arXiv:2012.15692.

Note

- A quick check on Google Scholar reveals hundreds of research articles on autostereograms. Unfortunately, â??autostereogrammetryâ?• isnâ??t a word.

Category

1. Film and media

Tags

1. cryptography
2. steganography

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