Perceptual Play: Optical Illusion Art as Radical Interface

Julian Oliver, 2008

In 1992 Joachim Sauter and Dirk Lüsebrink presented a work called *Zerseher* ('Iconoclast') at Ars Electronica, where they were awarded a prize in the Interactive Art category. In this work, audiences were invited to destroy a (digital) copy of an antique painting just by looking at it.

Zerseher provides a context for direct manipulation of the visible work. The position and orientation of the viewer's eyes are tracked using a camera which, in turn, directs a digital brush over the surface of the image, smearing pixels around. It's not hard to see why the piece was awarded; here the premise explored in philosophy and poetry, that the gaze might have a mutating or productive power of its own, was explicitly manifested: the mere act of looking had the power to alter (or destroy) the artefact itself.

Historically speaking, the idea that the gaze might be a primally destabilising force may have arisen from the fact that seeing itself is not always reliable; that the act of seeing – and perceiving what is seen – is something to be suspicious of.

Many works of philosophy and poetry have asserted the primary fragility of perception, particularly as related to the ocular sense. This can be traced back as far as Plato in Western thought, who was early in identifying that what is seen propagates as an object of thought – a mental image – separated from the world and that it is there that interpretation occurs:

"The image stands at the junction of a light which comes from the object and another which comes from the gaze".[1]

In recent times, the study of perception[2] has been as active in scienctific thought as it has in philosophy. How we perceive objects in the world, such that we can operate 'within' it, is naturally of great practical importance: perceived coherency in our immediate environment is primary to action; we instinctively try to reduce ambiguity in our surroundings in order to increase our possibilities for movement and reduce contingency. An example may be a shadow on the wall in the shape of a hand; if we cannot see the hand we become nervous and look for the reasons as to why this shadow is cast.

Moreso, these questions implicate heavily as to where the world ends and perception of it begins; in other words a primary existential ambiguity is implied by the very fact that we perceive at all.

Playful images.

Scientific enquiry into the fragility of perception has relied on the development of special images on which to base tests and use as common points of discussion. These images are valuable in that they describe the points at which perception begins to break down.

Illustration 1 gives a few examples of images which are considered *ambiguous* in our perception.

The top example, the famous *Necker Cube,* has ambiguous orientation, which changes depending on which square shape the viewer focuses upon. The form below appears to have two opposing states of internal depth, depending on which of the two large shapes you choose

1 Plato cited by Baudrillard in a translation of Jean Baudrillard, "La Photographie ou l'Ecriture de la Lumiere: Litteralite de l'Image," in *L'Echange Impossible* (The Impossible Exchange). Paris: Galilee, 1999: pp. 175-184.

2 The word *perception* comes from the Latin *perception-, percepio,* , meaning "receiving, collecting, action of taking possession, apprehension with the mind or senses."

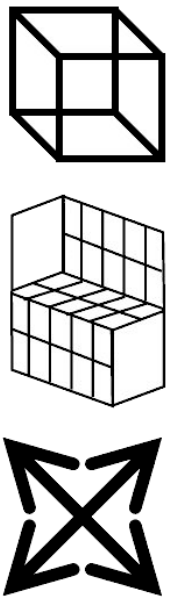

Illustration 1: A series of 'difficult' or ambiguous images.

to look at. The third form has arrows of either black or white. Such ambiguity is sometimes referred to as *bistable* or *multistable* perception and was widely used by Dutch artist M.C Escher in the creation of his works. Escher was very inspired by the work of mathematician and physicist Roger Penrose and directly appropriated some of his multistable or impossible images. The most apparent example of this are the famous *Penrose Stairs,* which appear to go both up and down when 'traversed' with the eyes (Illustration 2).

Op Art

Ambiguity and impossibility in visual perception have been widely exploited by artists over the centuries, resulting in a rich body of work whose common thread is to provide a context to play with perception itself.

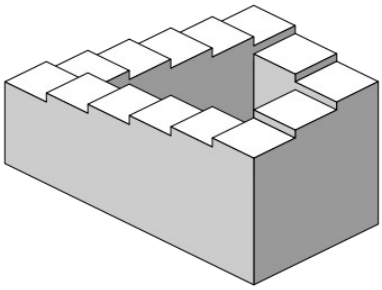

Illustration 2: Penrose Stairs

These objects of art are strange in that they draw attention to the relationship between seeing and sense-making, while allowing us to simultaneously play with this relation.

In these works, the artwork itself is a support designed to trigger a kind of interaction not normally considered within the realm of Interactive Art, which prioritises physical input and/or direct manipulation of the work being engaged.

Instead, such Optical Illusion Art (or *Op Art* as it was coined in a 1964 Time Magazine) provides for interaction by opening a critical space between seeing and perceiving, in an effort to encourage exploration of the mechanisms at work.

Op Art is a form of pure abstraction. The characteristics and formal qualities of this work are purposefully designed to produce perceptual abberations, illusions, and visual conundrums rather than serve as strictly aesthetic, narrative or representative supports. By being difficult to perceive it can be argued that much of these works are never 'seen' in their entirety: they oscillate in and out of multiple orientations, movements and states just by looking at them.

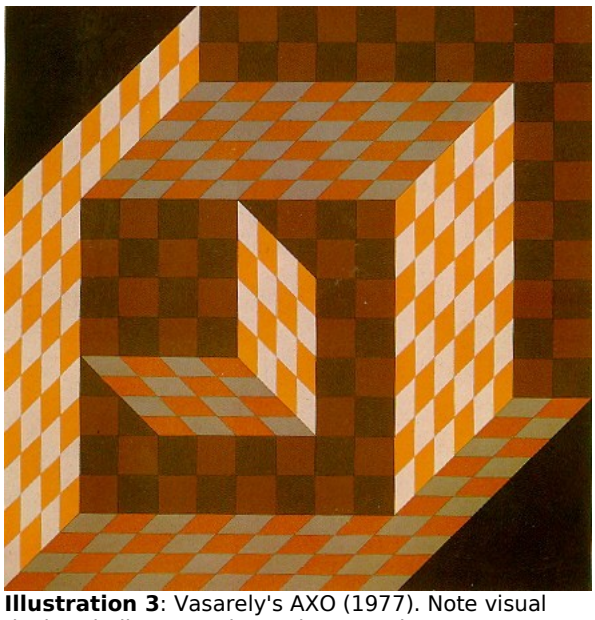

Illustration 3: Vasarely's AXO (1977). Note visual device similar to Necker Cube at work

The French-Hungarian Victor Vasarely is considered the primary pioneer of this line or work, with Bridget Riley soon to follow as a prolific and significant contributor to the field. Illustration 3 shows Vasarely's *AXO.*

At first glance *AXO* is clearly reminiscent of the *Necker Cube* above, driving us to attempt to satisfy the cognitive need to reduce ambiguity and build a coherent visual model of what is seen.

Operating in the work are several factors that cause this instability:

Initially it appears as an orthographic projection of either 2 or 3 cubiod forms. Each 'plane' of these forms are tesselated in one of 3 combinations of colour pairs, giving the appearance of lit surfaces.

Due to the perception that light is at work on these regions, we make assumptions of both form and orientation, looking for a coherent geometric situation that can accommodate all cubes at once. Our eyes move around the surface of the 2D pattern over and over pushing and popping orientations in an attempt to find a situation of geometric coherence. Regardless, our attempts to stabilise *AXO* as a whole image are thwarted indefinitely.

Strangely enough, the most difficult and revealing challenge this work presents us is simply to view it as it is: a flat plane of squares and diamonds of varying colour. Perhaps only then we can claim to have perceived the work as an entirety.

AXO somehow manages to simultaneously express many geometric states of the same object(s), something Husserl refers to as an object “variously presented”, offering itself as a counter-intuitive single-presentation of objects seen simultaneously in several different ways.

[...] in which such series of perceptions with their changing sensuous images take their courses, intuitive consciousness not of a changing multiplicity but rather of one and the same object that is variously presented.

Rather than exploring geometric impossibility, British artist Bridget Riley exploits aberrations in the way we perceive certain patterns to produce sensations of falling and movement. Riley's work is less interested in ambiguous and impossible images than those which I will call “motion-unstable” images. Much of her work has sought to design and trial conditions (or rules) where coherent perception breaks down and work which is known to be static in nature appears to move and slide around.

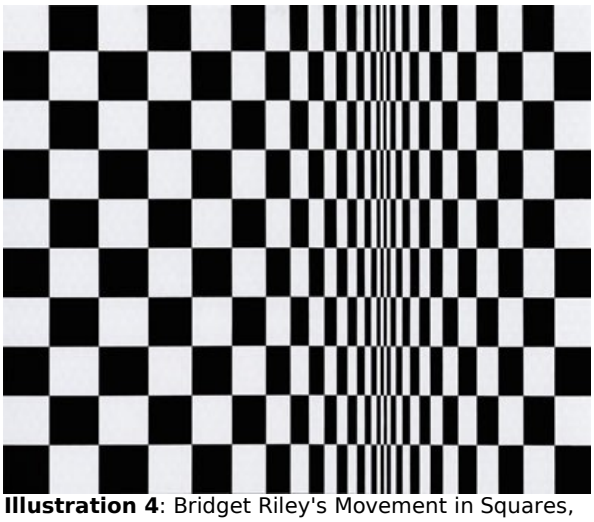

Illustration 4: Bridget Riley's Movement in Squares, 1961

One particular work of Riley's exemplifies this in detail: *Movement In Squares*, seen in Illustration 4, begins with squares at the periphery of the painting and gradually scales them laterally until they are very thin at the center. This not only produces the idea that composition is comprised of two curved 'sheets' but when studied for some seconds, they appear to be somehow rolling toward this vertical center. This movement is due to a human tendency to perceive lateral gradations as implicative of movement[3].

In effect Riley has created a 3 dimensional interactive work from purely static 2 dimensional components by exploiting an innate human tendency to follow pattern, to read it as something descriptive of form and even movement.

Here Riley has formalised a rule, a condition for playing with perception, which acts as the basis of a revealing game.

All Op Art positions perception as prone to error, interrogates its reliability and situates perception itself as the primary exhibition context. It challenges seeing as an immaculate carrier in the reliable transmission of information and provides a formal toolkit for playing with it.

Perspectival Anamorphosis and *Trompe-l'Oeil*

Experimenting with the creation of imagery that played with perception was prevalent several hundred years before the popular term *Op Art* appeared.

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3 This effect is probably due to the phenomenon of *lateral inhibition* in the perception of gradients in mammals. See Roy Lachman, Janet Lachman, Earl C. Butterfield, *Cognitive Psychology and Information Processing*, 1979. Also see phenomenon of *Mach Bands.*

Perhaps the earliest occurences were found in Judeo Christian cathedrals, where the desire to depict depth in mythological scenes on flat or near-flat surfaces led to the development of illusions that appear to defy their architectural context. Similar techniques were used to 'extend' the architecture itself such that the cathedral or church appeared to have greater dimension than it actually had. This illusion of upward depth became popular and was given the Italian name *Sotto in Su,* or “from below, upward”.

Illustration 5 shows this at work: the large dome apparent is painted on a barely curved surface.

Illustration 5: *Trompe L'Oeil* on the Jesuit Church, Vienna, by Andrea Pozzo. Large dome visible is a work of perspectival illusion.

These works deploy an advanced geometric distortion – or 'projection' - such that when the work is seen from the correct position it operates on the visual senses as intended, perceived as depth where it doesn't otherwise exist.

In this configuration, position is primary in the interaction. The body becomes a cursor of sorts that allows for the viewer to drive in and out of the illusion. This kind of optical illusion is actively participatory and is an early example of a work **designed to manifest in direct response to user-input**, played into existence through the body.

Like a great many contemporary interactive artworks, this participatory action incorporates the body in the perception of the work.

Using projectors and other techniques as a kind of 'stencilling' tool, large outdoor geometric abstractions have been created that are also activated in a similar way.

Illustration 6 is an example.

These works fall under the name Perspectival Anamorphosis and generally serve no other aim than to explore the raw mechanics of creating impressive illusions using minimal geometric description.

Here we have a curious difference between *Trompe-l'Oeil* and Perspectival Anamorphosis: the support, a scene of great corporeal depth, is rendered flat by the illusion such that the world - for a moment - becomes an image or screen.

Moreso, it only becomes an image because of the drive to produce coherency from apparent visual stimuli: we are satisfied when the seemingly disparate fragments align, completing an image and allowing for the production of sense.

Illustration 6: Large outdoor work of Perspectival Anamorphosis. Felice Varini, St Etienne, 2005.

Considering this as a work of art becomes difficult when we look for an artefact, or even a delimited region to which we direct our enquiry. The work operates at the intersection of a sensory input, the perceptive faculties, a great variety of objects, their surfaces and a privileged point in space.

Both *Trompe-l'Oeil* and Perspectival Anamorphosis can be understood as a kind of sensory projection, bound between the world and the sense-making apparatus. It provides a context for playing in the space between sense and sensed, rather than raw semiotic interpretation.

These works are not so much comprised of things or signs as 'events of sense', described by complex relations between the body, what is seen and how it is seen.

In these works belief, as a transport for investment, is primary in the success of the work; it collaborates with the cognitive desire to seek coherency in the formation of single, logical, perceptual propositions and it's here that the work lives and is interacted upon. We know the image of concentric circles doesn't exist in the world but against doubt it shouts out its form in the mind.

It is upon this image that the audience interacts, moving toward belief or away from it by changing bodily position in pursuit of the possibility, a very lively example of interaction in what is (formally speaking) a static artwork.

The artists are exploiting 'flaws' and special conditions in seeing, such that a known-untruth can rise – even if just for a moment – into belief. The resulting works can therefore be understood as formal experiments in producing the conditions for an augmentation of reality – a game of make believe.

This work proposes a radical kind of interaction design precisely because it **shifts the object of interaction from the corporeal into the perceptual**: beyond augmentation of the environment it is an augmentation of perception itself, replaying belief against known doubt with the agent as both lens (eyes) and steering controller (body movement).

Illustration 7: Another perspective defying work by Varini

Illustration 8: Same hall seen from different angle and position

Consider a screen-based interactive artwork - an artistic 3D game for example - and any supposed gulf between Interactive Art and this work is quickly challenged.

A 3D game uses a 3D graphics engine to produce the illusion of three dimensional space through the shading and skewing of triangles, all of which are drawn flat within a 2D 'surface' of pixels. There is no depth in a 3D game, merely the projection of it using a software camera whose *view matrix* transforms polygons – as atoms of representative space - in such a way as to give the impression of perspective. Illustration 9 describes this using a cube form as an example.

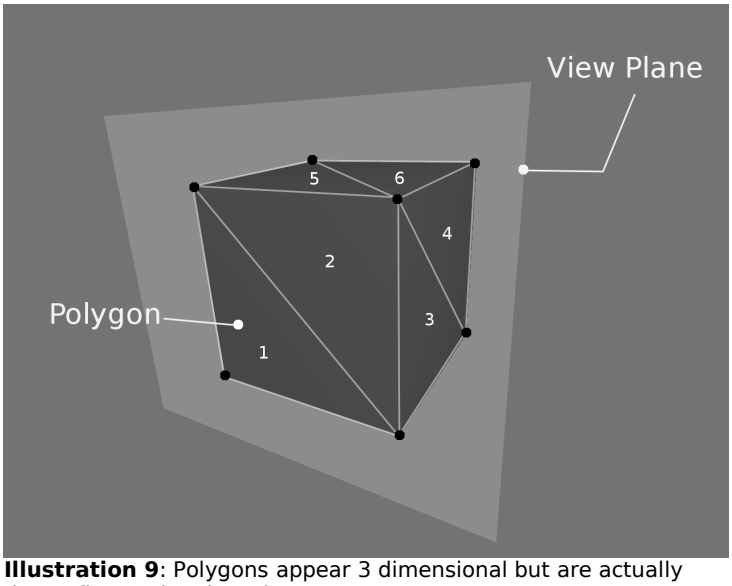

Illustration 9: Polygons appear 3 dimensional but are actually drawn flat on the view plane

The player uses his or her arms and fingers to shift the point of view in response to what is seen on the screen of a 3D game. The screen, as the final 2D surface upon which all the triangles are drawn, is comparable to the flat mental image perceived in Perspectival Anamorphosis.

Playing with Instability

Reading the ambgiuous images of Vasarely or the motion-unstable work of Riley as interactive art is not as conveniently easy as with the above perspectival works. Nonetheless to do so only requires deeper interrogation of what constitutes interfacing in the context of perception.

Ambiguous Op Art like that of *AXO* can be considered to contain several stable mental images whose axiomatic and opposing spatial properties undermine attempts at building a coherent scene in the mind. Each of these images – for instance the cubic forms in various orientations – are completed as rational perceptual objects in the mind through which we cycle as dominant logical propositions that might help us reach coherency.

Each of these stable sub-images can be considered interactive regions within the work.

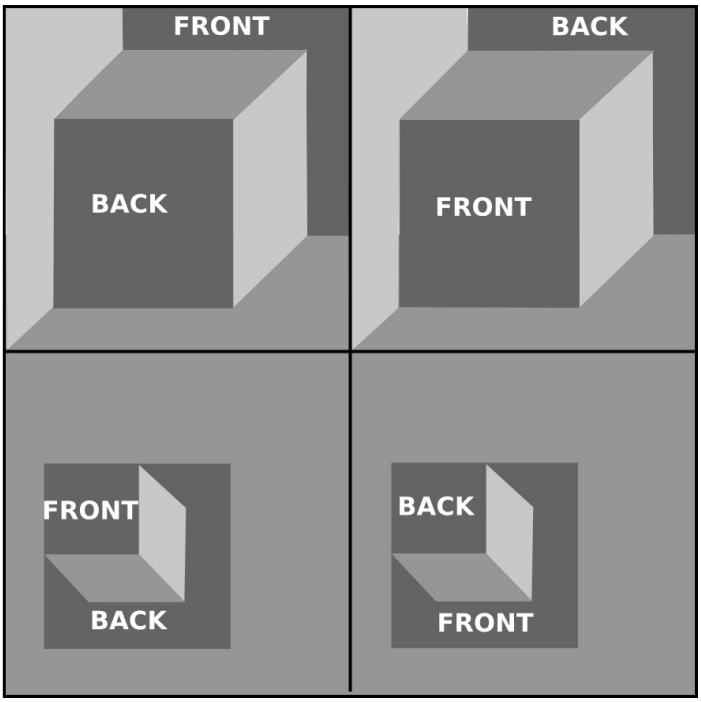

Illustration 10: The four stable images perceptible in AXO

The game – if one could call it that - is built around futile attempts to reach coherence. Through this work, the viewer plays with multiple stable images by moving the eyes and making believe in an attempt to reach this goal, a goal already abstractly prescribed by a primary and urgent drive in the perceptual faculties themselves.

Like *Zerseher,* the position of the eyes directly transforms what is perceived but without manipulating the surface of the painting.

Moreso, the work (the interface) of *AXO* operates as a kind of illogical machine comprised of several dissonant propositions, or 'actors', in the mind. Illustration 10 shows the four primary stable but opposing images in *AXO*.

AXO is in essence a puzzle. Riley's work however catches us off guard entirely and plays with us; suspended between the impossibility of what we know to be a static image and a wriggling form produced by a perceptual aberration.

With much of Riley's work there is nothing more to do than play live with these retinal and cognitive 'abberations', performing experiments with the phenomenon.

She says of her work:

"In my earlier paintings, I wanted the space between the picture plane and the spectator to be active. It was in that space, paradoxically, the painting 'took place [...]'"

Conclusion:

Perceptual Play of the kind seen in Optical Illusion Art may expand the scope of what is considered Interactive Art by configuring perceptual disparities, aberrations and illusions as playable interactive components which are engaged using body-location and/or eye-movement as interactors.

While it is convenient to view these works as singular painted artefacts – and using traditional methods of production – they were implemented with the strategic aim of interaction and play in mind as a kind of programmed and formal perceptual intervention. In doing this, they situate perceptual subjectivity as a site for immediate, playful experimentation and outside of an obligation to semantic interpretation or traditional - primarily material - interaction-design modes.

While it is certainly difficult to imagine programming or designing for this space with meaningful interaction in mind, work of this kind represents a valid and undoubtedly interactive design paradigm in the exploration of perceptual models and tendencies.

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