Representing perspective in photography

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Title: Representing perspective in photography

Stacking: This item is not stacked at May 2013. Some of the images used may contribute to the Major Assessment.
# Representing perspective in photography

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Abstract

The term perspective is commonly considered to exclusively signify linear or convergent perspective, though this is just one of many viewpoint systems used to codify the representation of spacial relations in artistic images through history and around the world. Byzantine, Medieval, classical Egyptian, Chinese and Japanese art use different forms of spatial relativity which may look unfamiliar or awkward to 21st century “Western” eyes, accustomed as we are to perceive the lines and angles of our urban landscape through the monocular lens of linear convergence principles.

Standard photographic definitions of flattened or steepened perspective conform to Renaissance ideals of perspective, as attested by the one-point perspective captured by the camera. This paper is a summary of differing perspective systems and an attempt to capture these depictions photographically. Using common photographic techniques, can these alternative (to Western eyes) depictions of space and distance also be photographically confirmed?

FRED-ref

Linear perspective, rectilinear perspective, reverse perspective, axonometry, axonometric perspective, orthogonal projections, orthographic views, inverted perspective, aerial perspective, atmospheric perspective, convergence, High Renaissance, Byzantine art, Medieval art, trompe l’oeil, value perspective, hierarchical perspective, conceptual perspective, Euclidian geometry, focal length, magnitude perception, Filippo Brunelleschi, Leon Battista Alberti

Web keywords

Perspective, photography, vanishing point, Renaissance, drafting
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Introduction

A personal introduction

I initially commenced this FRED item with the intent of investigating the difference of photographic image perspective according to the focal length of the camera, within photographs of the inner urban landscape. However, I was disquieted and my question became—what is perspective? It is assumed in many photography books that perspective means linear or rectilinear perspective. However, what we commonly term as “natural perspective” was actually formulated in 1400s Europe, and can be seen as a very Eurocentric view.

Classical Egyptian, Chinese, Japanese, Mayan and Persian art use different forms of perspective which may look unfamiliar or awkward to 21st century “Western” eyes and some have argued these are not faithful depictions of real imagery, as proven by the one-point perspective captured by the camera. Until the mid-twentieth century, the dominant Western assumption regarding perspective and depiction were based on “camera" theories of visual perception, assuming that classically created images were essentially two-dimensional faithful copies of our mental perception of the world around us. However, it is well accepted that the imagery created by children (and many untrained artists) does not conform to linear perspective. (Willats, 2006, p. 207.)

However, using common photographic techniques, can alternative (to Western eyes) depictions also be photographically confirmed?

Scope of this FRED

In summarising several varying historical conceptions of space and landscape, this FRED describes an experiential learning investigation of use of various photographic techniques to illustrate these depictions. This paper does not presume to be an examination of all historical representations of spatial distance, a comprehensive analysis of each of these perspectives, nor the cultural, philosophical, religious and physical environmental contexts that may contribute to these different spatial depictions, though these would be valuable to pursue in further FREDS.

“As the saying goes, there is nothing like a camera to make a molehill out of a mountain.” (Derksen, 2005, p. 238)
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What is perspective?

What is perspective?

Perspective is a term for conventions and devices for symbolising a sense of distance within a two dimensional space on a plane (March, 1927, p. 69). Goncharov & Tiapovkin (2008, p. 35) state our understanding of perspective as “a system of techniques that permits the representation of the three-dimensional structure of objects and their position in three-dimensional space”. Thus, perspective is the way that we perceive the world of three-dimensional structures, as two-dimensional planes can only convey three-dimensional concepts of distance, depth and volume by certain devices.

Petterson (2002, p. 137) describes that our perception of depth and the spatial relationships between objects in images is generally learned (my italics) and relates to lighting, the placement of shadows, composition and cropping, line weights, the use of texture, relations of size and overlapping of objects, sense of bareness or amplitude.

Edgerton notes (2005, pp. 1750-1751), that although people experience a natural vision of lines converging as they approach the horizon, there is not an innate predisposition to depict this in art, unless the technique has been previously encountered or learned: that is, the drawing of linear perspective is a learned skill, rather than an inherent urge.

As far back as 1709, Bishop Berkeley questioned the notion of a universal idea of perspective, when he noted that pictorial cues regarding perspective are arbitrary, depending on prior assumptions. (Koenderink & van Doorn, A, 2006, pp. 147-148)

As Gombrich conjectured whether, though we may assume that “natural perspective” is veridical, given the fact that different cultures and ages have depicted the world in such different ways, will our sense of visual truth look as stylised and unconvincing to future ages as Egyptian paintings look to us? (Willats & Durand, 2005, pp. 319-320.)
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What is perspective?

**Linear perspective**

When we say perspective, we commonly imply the notion of linear or rectilinear perspective (Pettersson, 2007, p. 137). Linear perspective is essentially a cross-section through which ray-like lines converge in the distance (Lynes, 1980, p. 90).

The oldest surviving text regarding linear perspective is 300BC, by Euclid. Subsequently, Arab and Greek mathematicians developed the ideas further, and their treatises became available to Europe in the 13th century AD (Robbins, 1994, p. 2). It is generally acknowledged that Florentian architect, Filippo Brunelleschi, perceived and demonstrated the convergent perspective via means of two mirrors or lenses in around 1425 (Edgerton, 2010, p. 149; Lynes, 1980, p. 96). Leon Alberti codified Brunelleschi’s system in the treatise, De Pictura, introducing a gridded window as a tool to aid the artist’s eye with the printing of this book in 1540 eventualizing linear perspective as characteristic of High Renaissance art (Edgerton, 2010, 150). The convergent lines and the vanishing point introduced the notion of infinity to art and the classic depiction of a tiled floor became an image standard signifying order and stability, integral to our art based impressions of classical architecture (Kennedy, Juricevic, Hammad, & Rajani, 2007, pp. 40-41). Arnheim (1974, p. 424) postulates that central perspective was introduced at a time when Western artists were ready to abandon object size and shape in order to pursue a notion of depth.

As Edgerton states (2005, p. 1750), the inclusion of the technology of linear perspective in Western Art tradition not only changed the way images were drawn, but more importantly, has influenced the way that we perceive spatial depth as being exclusively dependent on visual-angle ratios (Kennedy et al, 2007, p46).

(See figure 1.)

Hansen’s curvilinear perspective introduced the idea of curved converging lines, which act as contours, embracing and surrounding elements in one direction and excluding them in the other. (Arnheim, 1974, p474). Saenredam’s The Interior of the Grote Kerk at Haarlem employs curved convergent lines to create a wide-angle view of the space.
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What is perspective?

Other perspectives

Though psychologists have concluded that early childhood representations of spatial distance bear some resemblance to non-Euclidean geometry (Edgerton, 2005, p. 1751), this does not indicate that non-linear perspective images of older or other cultures are childlike or inferior. Other pictorial signifiers and use of alternative views have been embraced by some of the most sophisticated (and beautiful) imagery systems in posterity, including Persian manuscripts, Japanese landscapes and Chinese scrolls (Edgerton, 2005, pp. 1751-1752). In the 1970s, Goodman questioned the exclusive position of linear perspective as exclusive factor in convincing imagery, and concluded that there are many ways of representing reality pictorially, and the choice of which way is normally based on convention or learned response. (Derksen, 2005, p. 235). (Some of these ways will be summarised below.)

Reverse perspective

Oskar Wulff first used the term “reverse perspective” in 1907 to describe the combination or overlapping perspective favoured by Byzantine and Medieval artists, in which views from above, from the front and bird’s-eye view were combined in the one image plane. (Antonova, 2010, p. 464.) This summary of viewpoints results in an inner perspective, where the viewer’s standpoint is situated inside the pictorial space.” Another distinctive feature of the Byzantine reverse perspective is the idea that figures situated in high places are depicted as if through a wide-angle lense, as larger than central figures (Antonova, 2010, p464).

Contrasting theories by writers such as Florensky suggest that Byzantine and Medieval artists compensated for curves or distances of the painted surface by increasing the magnitude of the figures higher or further away from the standard exterior viewer, in the manner of trompe l’oiel. Hence, proportions would be less distorted to the viewer, who would experience space in a non-stationary way, or as anti-perspective. (Antonova, 2010, p465; Wade, 1999, pp. 1115-1116). Recent studies have concluded that reverse perspective is not a primitive response to the visual world, but rather, a developed sense of constancy of magnitude perception (Goncharov & Tiapovkin, 2012, p. 45), whereby distant objects are compensated in size.

Alternatively, Antonova documents (2010,p. 465) that Doelemann proposed that Medieval and Byzantine artist considered no spatial relationships regarding size of image components, but rather they were utilising a version of hierarchical or value
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Perspective (see discussion of Egyptian Value perspective). Arnheim (1972, p127) also postulates that reverse perspective is a myth, and that Byzantine and Medieval artists employed size variations based on the importance of central figure. (See figure 2.)

Figure 2. Byzantine religious image. Reprinted from What’s an icon again, really?, by Reinkat. Retrieved May 17 from http://www.wga.hu/frames-e.html?/html/r/raphael/4stanze/3borgo/1borgo.html. Copyright not specified.
Parallel perspective or axonometry

One of the pictorial standards refined in Classical Chinese art is referred to as axonometric or parallel perspective. (Edgerton, 2005, p. 1751.) Axonometric projection is defined as a pictorial language in which lines recede but do not converge: that is, the lines of projection remain parallel. This is often accompanied by a uniformity of scale of figures in foreground and background. (Krikke, 2000, p. 7.)

John Hay has noted that from the 13th century, Chinese landscape painting had moved beyond the mere illusion and mimicry of the natural world and instead used the medium of paint on paper as poetry (Fong, 2013, p. 274). Though the representation of space was fundamental to Chinese landscape art, the spaces were conveyed by combination viewpoints. (Robbins, 1994, p. 2). Especially in Chinese landscape painting, a moving focus is employed, expressing spatial recession in a planar structure. Rather than viewing a scene from a monocular vantage point—such as the window view in Renaissance art—Classical Chinese artists place image objects as if from an expanded field of vision, resulting in the eye being led over the landscape. (Fong, 2003, paragraph 44; Robbins, 1994, p. 2) As Wong is quoted in Bolewski (2008, p. 32), the painter constructs a landscape with positions, directions, proportion, transitions, overlaps conforming to a natural order, as they feel is harmonious, rather than according to Euclidean grammar. The parallel receding lines have been believed as enabling the eye to move more fluidly through the special landscape (Robbins, 1994, p. 2). Various scholars have also commented that parallel perspective was used as a device to create harmony between multiple scenes in a painted scroll (Tonder, 2006, p. 729).

Arnheim argues that the use of axonometric perspective in Japanese art is so strictly upheld that many Western viewers (trained to expect convergence) perceive the parallel receding lines as diverging (1972, p. 128).

Types of parallel projection, including orthogonal projections were also extensively used in exemplary medieval art, such as the Bayeux Tapestry, and have become the cornerstone of drafting for modern engineering. (Willats & Durand, 2005, pp. 322-323)

See figure 3.
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What is perspective?

Aerial or atmospheric perspective

A lesser-known pictorial grammar used in classical Chinese and Japanese art is the use of tonality of colour to create the illusion of distance or proximity on landscapes. Known as aerial or atmospheric perspective, distant elements were depicted as hazy and subdued, with immediate elements rendered in brighter hues and more clarity. (Edgerton, 2005, pp. 1750-1751). As Edgerton (2005, p. 1751) and Harrist (2011, paragraphs 15-20) note, the rendering of focus is perhaps indicative of the cultural respect for philosophical contemplation. (See figure 4.)

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What is perspective?

**Value, hierarchical or conceptual perspective**

It has generally been accepted that (ancient) Egyptian art was conceived within a system of a squared grid in order to determine proportions of figures (Robbins, 1994, p. VII). Egyptian artists accepted that the drawing surface was flat, so the aim was to depict compositions of symbols and objects in their most characteristic forms; that is, from the manner in which they are most strikingly defined. (Robbins, 1994, p. 3) As Pettersson notes, (1943, p. 140), it is more immediately easy to comprehend frontal projections at eye level than those from above or an angular representation. Pettersson (1943, p. 142) and Clark have argued that Egyptian artists, like younger children, use representational systems, depicting figures as they are known to be, rather than seen to be (Willats, 2006, p. 207).

Egyptian art was also developed according to a system of scale or value, in which the relative importance of figures was encoded according to their size representation: for instance, the Pharaoh may dominate the scene involving their subjects, but there was no scale variation in relation to gods (Robbins, 1004, p. 8; Pettersson, 1943, p. 143). (See figure 5.)

Arnheim (1972, p. 127) notes that Renaissance artists such as Tintoretto and El Greco endowed their images with hierarchical prominence even within their classical linear framework.

In urban surroundings, we are constantly subjected to straight lines, edges and angles, which exert a strong influence on our perceptions and we may continue to perceive these surrounding in terms of linear convergences (Goncharov & Tiapovkin, 2008, p. 26).

As an experiential exercise, I utilised a variety of photographic and image-merging techniques to attempt to transcend my automatic assumptions about linear perspective and illustrate the concepts discussed above.

**The equipment**

Canon Eos 1100D,

EF-S18-55mm lens, 70-300mm, EF 50mm

Tripod
Linear/rectilinear

Generally speaking, moderately wide-angle lenses are said to be a good starting point for representing rectilinear and oblique views. (Kopelow, G., 2007, p. 79). A standard camera lens takes in a narrow cone of light, and this can act much as Bruschellini’s lens to affect a convergence. (Kennedy et al, 2007, pp. 41-42)

The issue with shooting urban landscape is often an aesthetic one, as narrow spaces and proximity of buildings can limit the sense of infinite perspective. Still, the sense of linear convergence is obvious.

The use of standard wide-angel lens clearly chows the lines of shopfronts and the brickwork footpath in convergence.

Lens: EFs18-55mm
f-stop: f/3.5
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Photographic depiction of perspective—the experiment

Reverse perspective

Photographs were taken without use of tripod, as I could not situate the tripod on a high enough plane. Nine photographs were taken, with the photographer standing in one position, moving and turning as little as possible. Opening the photographs in Adobe Bridge, I used Photoshop’s Photomerge tool to merge. The quantity of photographs seemed to tether Photoshop and I was compelled to execute hand manipulations to combine separate merges. The process also required custom adjustments of the lighting curves to aesthetically merge the panoramas.

The effect of the wide-angle lens along with the merging of images taken from nine different points of view mimics the multiple perspectives common in medieval artworks. Similar to the effect of sketching a subject from alongside, then moving closer for detail etc, the nature of the merged images shows details in a combined perspective.

Lens: EFs18-55mm

f-stop: f/3.5
Photographic depiction of perspective—the experiment

Parallel perspective or axonometry

As Bowlewski (2008, p. 32) notes, while the nature of the camera presupposes a monocular vantage point, and hence a limitation of certain aspects of Chinese classical view, axonometric perspective does have some common points to the flattened perspective. As such, I used a long focal length and zoom in order to mimic the non-convergence of lies.

The sense of convergence was difficult to overcome. Nonetheless, the less extreme convergence than wide-angle did eventuate, closer in look to parallel perspective, if not actually mathematically faithful. The top and bottom receding lines of the blue roof appear to be diverging, as the sense of convergence is so restricted.

Lens: 70-300mm (zoomed)

f-stop: f/4.6
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Photographic depiction of perspective—the experiment

**Value**

As Kopelow (2007, p. 28) states, short focal lengths exaggerate the size of objects closer to the lens comparative to similar objects further away, as well as emphasizing details of the closer object.

To enhance the exaggerated perspective, I utilised a wide angle lens and positioned myself adjacent to the closest subject.

Lens: EFs18-55mm

f-stop: f/11

(Longer shutterspeed resulted in motion.)
Atmospheric perspective

To facsimile aerial or atmospheric perspective, I made use of the attributes of very small depth of field to facilitate foreground focus and blurring and recession of more distant elements. As depth of field is a function of aperture size and focal length, (Kopelow, 2007, p. 29), I made use of a very low f-stop and a short lens to highlight certain objects and apply a bokeh, the aesthetic lack of sharpness, to more distant features (Ang, 2011, p. 80).
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Critical Analyses

On reflection, I possibly set myself too capacious a subject to investigate for this FRED. Historical art theories are a boundless area to research and perhaps the range of pictorial languages to recreate via camera was too expansive for one investigation. However, I had felt that by investigating one definition of perspective, the standard photographic rectilinear perspective, I was not doing justice to cultural systems beyond our most immediate. The assumption that the only correct system of perspective is the traditional monocular window/camera view is no longer as valid in an era in which digital techniques which document alternative views, such as panoramas and the use of bokeh, are industry standards.

Though cursory, I believe the summarized accounts of various alternative historical special viewpoints have been a valuable investigation and lead me to a range of excellent academic readings regarding information design, which is imperative to a Masters of Digital Design. Concepts such as depiction of figures and elements in their most immediately recognizable state is directly relevant to the design of diagrammatic and information graphics.

Generally, I believe the photographic constructions of alternating perspectives were successful, the attempt at parallel perspective being the exception which was not properly fulfilled. Further examination of photographer position and possibly a more extreme zoom lens would be required to further the experiment to simulate axonometric projections.

In the quest to represent value perspective, I was hampered by unwilling participants and my inability to find a neutral background which did not illustrate the distance. As such, the final images were not as I had planned, though the sense of exaggerated distance and size does mimic the value system. I misused the aperture, and inadvertently used a shorter f-stop, diminishing the depth of field instead of enhancing it and the subjects were energetic enough to subvert the longer shutterspeed.

The initial and ultimate goal of this FRED was to extend my knowledge of lenses and to discipline my photographic “eye”. To this extent, despite my divergence to a broader goal, the FRED has enhanced my utilisation of my camera as well as specialist techniques such as panorama shooting and photographic manipulation.
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Critical Analyses

The photographing of inner urban settings such as laneways, bridges, etc., has been a valuable exercise in enhancing my photographic acumen and sharpening the visual composition of photographs. The most challenging component of this FRED, it is the aspect that I did not master. Though I believe my excursions into photographic techniques to mimic spatial representations were mostly successful, my photographic eye for standard work is still at the novice level. However, the shear experiential task of taking the hundreds of photos, changing lenses to examine effects, studying the resultant images to find the range of viewpoints needed, etc., has been a valuable exercise for me.

Finally, the very nature of carrying a newly acquired camera bag and summoning the tenacity to shoot photographs and change lenses in crowded settings has benefitted my confidence and given me the courage to pursue urban photographs for my major assessment.
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Possible further investigations

How perspective is perceived by different world cultures today
The role of linear perspective in information design
Cultural differences in the perception of perspective
Time-lapse photography and narrative frescoes
Focal length
David Hockney’s Secret Knowledge
Sacred geometry in design and art.
Arnheim’s theories of perspective
Lacanian theory
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Q&A

Question 1

Who is credited as introducing the concept of linear perspective to Europe?

- Though Euclid wrote of the necessary geometry in 300BC, Brunelleschi is credited as generating the first European (Florentine) image using linear convergence. Alberti further developed the concept and proposed the use of a geometrically gridded window as an artistic aid.

Question 2

What is a generally accepted definition of reverse or inverted perspective?

- The term is generally applied to the sort of overlapping viewpoint used in Byzantine and Medieval art, where there are various views, placing the observer in the midst of the image components. Further aspects include the idea that component sizes do not conform to the idea of further figures diminishing in size. It has been postulated that this viewpoint may also hold an adherence to hierarchical perspective, with dominant features being given more spatial importance.

Question 3

Which types of perspective utilized in classical Chinese and Japanese landscape art which differ to Renaissance perspective?

- Parallel perspective
- Atmospheric perspective
- Axonomic projection

- Hierarchical perspective
Question 4

Why did Gombrich conjecture that our current realistic art might look as stylized to future viewers as ancient Egyptian friezes look to us?

- Though many assume that linear or convergent perspective is a true or natural perspective, many researchers have concluded that our perception of the natural world is influenced by exposure to common artistic conventions, in the case of modern European art: linear perspective systems.

Question 5

How may a short focal length facilitate the capture of an image of figures mimicking value or hierarchical perspective?

- Wide-angle lenses exaggerate the size and sense of distance between objects in the foreground and background.
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References


Harrist, R. (2011). *Chinese landscape painting as western art history* (’chinese landscape painting as western art history’ & ’the great image has no form, or on the nonobject through painting’) (book review) *College Art Association.*
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References


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References

Illustrations


   {PD-Art}


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Appendix

**Bibliography**


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Appendix


Appendix

