A NEW PERSPECTIVE ON THE USE OF PERSPECTIVE IN URBAN VISUALISATION.

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Abstract: Fundamental to the visual efficacy of the perspective image in urban simulation is the assumption that it mimics the way we see the world around us. However, some theorists question the validity of this assumption. Indeed, it can be argued that perspective is merely a convention or style. If so, it may simply be another method among many culturally alternative methods of spatial representation. Nevertheless, the almost mythical power of perspective imagery to organise the visual world continues to both homogenise and hinder investigation of culturally alternate forms of visual communication. This paper compares some regional variations on spatial representation with Western perspective, highlighting the potential to extend the existing paradigm.

Keywords: perspective, convention, 3D CAD, cultural alternative
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1 INTRODUCTION
Since the late eighteenth-century, perspective drawing has been taught in design schools as the preeminent method for spatial representation (Blackman, 1998). Its latest manifestation is in 3D CAD and VR. Fundamental to contemporary notions of the perspective paradigm (photography, cinematography, TV, 3D computer graphics and so on) is the implied assumption that it mimics the way we see the world around us (Edgerton, 1991; Gombrich, 2000; Foley et al, 2002). While research investigating visual perception, in particular perception of perspective images, remains inconclusive (Gordon, 1989), the use of perspective images as surrogate visual experiences continues mostly unchallenged. However, research conducted by other theorists (Wartofsky, 1979; Gibson, 1979; Deregowski, 1972; Gregory, 1966) tends to question the validity of the assumption that perspective replicates natural vision. Indeed, it can be argued that perspective is merely a convention or style (Panofsky, 1991; Kemp, 1990). If we accept this view then we see how it is not different to culturally alternative spatial representations (Willett, 2002; Schwimmer, 1990; Levi-Strauss, 1983). In turn, this questions the assumed neutrality of perspective (Coyne, 1995; Winograd and Flores, 1988; Edgerton, 1991). The neutrality of perspective is predicated on its scientific validity. It is the combined scientific (geometric) valorisation and implied visual replication of perspective which both empowers it as a method for organising the visual world and hinders investigation of culturally alternate forms of visual communication. Moreover, the sheer ubiquity of perspectival imagery today threatens to homogenize global visual communication. This paper aims to challenge the superiority of perspective by providing a counterpoint. Not a prospective view, but a short exploration which analyses perspective as merely another artistic convention or style among many regional variations for spatial representation.

2 PERSPECTIVE PEDAGOGY
Since the late eighteenth-century, perspective, and later projective geometry, has been taught in design schools (such as the Ecole Polytechnique, Beaux Arts, Bauhaus etc) as the pre-eminent method for mimicking ‘nature’, or more precisely ‘reality’ (Blackman, 1998). Concomitant with this, the use of grids and axes, precise decimal measurements, and so on, became the ‘obsession’ behind all modern design endeavours to follow. Apart from a brief, but enduring, exploration of the infinitudes of axonometry – which in a manner forecast design using 3D computer graphics – a practical knowledge in perspective construction became a design aim in itself. By the mid nineteenth century school-age children were taught how to draw simple solids in perspective, an important step in the acculturation to perspective as a way of ‘seeing’. According to the architectural historians Alberto Perez-Gomez & Louise Pelletier (1997, p304), our (Western) contemporary accepted notions of a Descartian ‘objective space’ emerged from descriptive geometry, and
“perspective theory was the invisible hinge systematising its projections.” It initiated the epistemological model for the acquisition of a scientific truth that has made possible the Industrial Revolution, photography and cinematography, panoramas and dioramas, CAD and VR.

This has not happened without its challengers, however (Damisch, 1994; Gombrich, 2000; Perez-Gomez and Pelletier, 1997). With the advent of the photograph in the mid-nineteenth-century the then scopic obsession with realism in the arts and science was challenged by the extremes of impressionism and pointillism. This was followed, in the twentieth-century, by cubism, futurism, and eventually abstract expressionism. Marcel Duchamp’s early twentieth-century explorations in non-mimetic indexical representation is an example of an alternative reversible projection through his deliberate use of shadows and anamorphosis. His and others’ work highlighted the ambiguity between perspectival illusion and reality (Tu m’ (1918) comes to mind). It called for a new form of participation from the spectator. No longer a passive observer of an all-revealing perspectival realism, his work reinvigorated allegories of the medieval ritual. Since then, the computer, and its efficient 3D rendering algorithms, has re-established perspective as the dominant contemporary visual media (Foley et al, 2002).

3 COMPUTER AIDED DESIGN

Today, the almost ubiquitous reliance on 3D computer modelling as a decision-making tool in architectural visualisation of urban infrastructure sees architects, planners, and developers base their decisions on the agreed instrumentality of perspectival space as a metaphor for a ‘window on reality’ (Panofsky, 1991).

In its most visible form, CAD systems, it is often used as a digital version of the pre-existing drafting paradigm. According to Levy (1997, p9), despite the use of CAD to extend traditional drafting, a distributed, fragmented process, it “has [simply] reaffirmed traditional values rather than [create] a new paradigm.” For Perez-Gomez and Pelletier (1997, pp377-78), in 3D CAD, the “seductive manipulations of viewpoints and delusions of three-dimensionality, …[is] still little more than an efficient ‘mechanism of composition’…. [It has] contributed next to nothing toward destructuring the [eighteenth-century] hegemony of panoptic space and proposing a more meaningful and participatory urban space.” Hence, it would seem 3D modelling in the computer-aided design of architecture tends to perpetuate the perspectival paradigm where form continues to be the focus of attention. This adds currency to the culture of pragmatism evident in computing generally – the pragmatic theme “advocated by much of Silicon Valley culture” (Coyne, 1995, p5). The current wave of accessible computing is pragmatically oriented. It displays an open optimism about technology, and falls within a long tradition of rationalism since the rise of both perspective and the scientific method in the European Renaissance.

This pragmatic rationalism is manifest in the role computer modelling plays in governments’ urban and regional planning strategies. Local, State, Federal and International issues related to the use and development of land and
resources are increasingly being modelled on computers to increase the apparent ease to which the data contained is understood. Strategic urban planning using a computer modelling approach assists planners to rationalise their appropriations of space under the guise of representing it in a more easily understood and meaningful way. Their use of projected orthographic mediums both frames and determines its spatial appropriation.

While the ability for computer visualisation to "act as a surrogate for the actual experience of the proposed development" is questionable (Levy, 1995, p24), the greater accessibility and acceptance of mathematically accurate CAD and computer simulation has, nevertheless, led to its increased appearance in every type of planning, architectural, and development dispute resolution. Such simulations, including animations, follow mathematically derived rules providing phenomenally “accurate descriptions of proposals and [simulations of] the impacts they might cause” (Decker, 1992, p143).

The 3D vector model simulation may be most closely aligned with our spatial experience, however, it cannot be assumed that the layperson has been previously exposed to this mode of viewing. Such mathematically accurate computer modelling, and the use of animated sequences to incorporate the perception of motion through space as an 'as real' visual immersion tool, raises the question of just what is real and what is illusion. As animated or still visualisations, they are expected to act as surrogates for the actual experience of a proposed development. These computer visualisations use projected geometry to accurately portray three-dimensional 'scenes'. The computer monitor, projector or printed image is in this sense, a modern extension of Panofsky’s 'window onto reality' (Elkins, 1994).

The metaphor of visual accuracy we know as a perspective’s ‘point of view’, is a common goal of architecture design narratives. It can be used to identify a particular position either physical or imaginary in a perspective image. This position can be adopted by others. In planning, conservation plans use the notion of a point of view extensively. Conservation plans typically use "perpendicular views of facades from across the street rather than oblique views, chosen for simplicity and clarity," and so on (EEMCP, 1987) (see figure 1a) (see also Wyeld and Allan, 2001). These are then 'modelled' and one can 'experience' a given 'viewpoint' (see figure 1b).

Projected geometries, in particular representations of perspectival geometries, are considered useful in helping architects, planners, developers, and laypeople alike, to analyse space based on the apparent unity perspective applies to each object in a scene related by distance alone. No object can appear larger than any other without occupying its ‘correct’ place in relation to all other objects. This reliance on perspectival constructions to unify space is used to help contextualise streetscapes. In historically and culturally significant urban precincts perspective is used to assist in the unified identification of what is desirable about a streetscape as a whole.

As discussed, when photography, computer-modelled renderings, or manually drafted perspectives are used for urban development decision-making their guidelines typically assume the viewer is placed at the correct location for adopting the centre of projection view (Sheppard, 1989; Levy, 1995; Richens,
Apart from the use of a panorama (and even this has its top and bottom cropped), these guidelines assume that what we look at is, ‘in-essence’, a flattened segment of a sphere in our focal range. It follows that we can then ignore the remainder. What falls within the region is what is important\(^1\). What we know, on the other hand, is that our peripheral vision is crucial to our experience of space. Hence, while a two-dimensional surface is relied on to signify the space under study, the limitations of its ability to convey the ‘experience’ of how we ‘live space’ remains.

Figure 1. (a) Sectional view used in a conservation plan (EEMCP, 1987); and, (b) its 3D modelled corollary.

4 PERSPECTIVE AS LEARNED CONVENTION OR PHYSIOLOGICAL FACT

As broached earlier, the visualisation technician cannot always assume that their clientele are familiar with this mode of viewing. Indeed, it has been argued that one needs to have a prior-acculturation to this mode of viewing before they can make sense of what is depicted in a picture, on a monitor, or a screen. Although, exposure to perspectival imagery (photography, cinematography, TV, 3D computer graphics, and so on) is increasingly difficult to avoid. Nevertheless, this form of acculturation is distinct from our natural perception of the world around us.

Just when we are able to begin to perceive the world around us as three-dimensional is open to debate. To an infant, objects are sensed haptically in a topological landscape. Piaget and Inhelder (1956) claim, while infants in the 4-6 age group relate to objects as being either close to them or faraway and separate from each other, they are not able to see them as a collective. To be able to envisage objects in terms of a particular viewpoint, the child must transform their simple topological relationships into projective relations. Once a child is able to adopt a ‘viewpoint’ other than an egocentric one, objects can be sensed as empirical three-dimensional volumes in what psychologists call ‘psychophysiological space’. “Psychophysiological space is the realm of

\(^1\) Today the all pervasive nature of projective geometry and its associated ‘window’ is not confined to the realm of development visual simulation perspective alone. It is manifest also in the effectiveness of technologies such as radar, infrared imaging, laser sensors, and 3D computer games which all depend on the same logistics of perception (Manovich, 1993).
immediate sense experience, neither infinite, isotropic, nor homogeneous" (Edgerton, 1991, p69). As adults, objects near to us are sensed as Euclidean or three-dimensional. At the edge of our psychophysiological space objects lose these qualities. For example, we perceive the distant full moon not as a ball but as a disc painted onto the inner surface of a hemisphere.

Despite the necessary distinction between perception of an artificial world and a haptic, topological world, many researchers claim that our perception of the world around us is also reflected in how we perceive perspective images of it. Edgerton (1991, p6) claims that experimental psychologists (Leehey, Held, and Vurpillot) “have shown that all human beings, even in infancy, tend to perceive natural shapes [in a perspective image] as more or less replicated regular geometric forms...[in psychophysiological space. Hence.] the ability to image regular three-dimensional objects in the mind’s eye seems universally endogenous to humankind." Unlike Piaget and Inhelder (1956) Edgerton does not identify an age for his ‘infants’. In contrast to Piaget and Inhelder’s (1956) findings, Deregowski (1972, p-82) claims that “although children do not learn to read until they are about six years old, they are able to recognize objects in pictures long before that.” For Kemp (1990, p337), being able to read a perspective “does not appear to require cultural schooling or systematic acclimatisation..... [With the provision, however, that this only applies to] anyone who has grown up with a normal variety of visual experience..... [He goes further, claiming that] linear perspective does not correspond literally to the way we ‘see’, but it does ape certain features of the array of visual information presented to us and it does so in such a way as to exploit a set of fundamental perceptual responses which ultimately lie beyond cultural conditioning.” Kubovy (1989), on the other hand, claims that, in relation to the same pictorial typology, one needs to know what to expect before they collude with what is otherwise merely an illusion. What all these discussions assume is the physiological ability to recognise objects depicted in a geometrically constructed image such as a perspective.

5 PERSPECTIVE RULES

Whether the tendency to perceive shapes in an image as more or less replicated geometric forms in psychophysiological space is universal (regardless of race, gender, or culture, as Edgerton (1991) argues) has been the subject of debate on visual perception since the time of Plato, and most likely before. More recently, this debate has been argued by philosophers, psychologists, physiologists, art historians, and other theorists. It was Descartes, Kant, and the work of subsequent nineteenth-century philosophers that paved the way for the establishment of a psychology which pursued a rigorous scientific investigation of visual perception. Yet, despite their obvious attempts to define what visual perception is, to-date there is still no definitive general theory of visual perception. There are too many differences between the various competing theories for a single theory to emerge. Most perceptual hypotheses are closer to intuitions than to formal statements. The main contemporary theories of visual perception include: Weber and Fechner’s psychophysics and the concept of the sensory threshold; Wertheimer, Kohler, and Koffkas’ Gestalt theory; Young, Helmholtz,
and Herrings’ neurophysiology; Marr’s Computational Theory of Vision; and Gibson’s Ecological Optics (Gordon, 1989). Much like the particle or wave model used to describe the properties of light, each model of visual perception is helpful in describing a different aspect of ‘seeing’.

Building on the work of those before them (Descartes, Leibniz, Kant, and Helmholtz) these psychological and psycho-physiological investigations of perception often questioned commonly accepted notions of reality itself. For example, based on Kant’s principle of epistemological dualism, the Gestalts’ argued that there was both a noumenal (objective, external) world and a phenomenal (subjective, internal) world. In this sense the world could be both real and formed in our imaginations. Much of their research centred on using tests such as the Ehrenstein figures (optical illusions). Indeed, the later work of Adelbert Ames and even Escher’s sketches tend to suggest that much of what we claim to replicate reality in a perspective is in fact merely an illusion. This is typical of the cognitive scientists’ approach who tend to focus on those things that we cognate: pictures, puzzles, words, lists etc.

The philosopher Marx Wartofsky (1979), on the other hand, suggests that when we reflect on how the world appears to us the images formed in our imagination simply follow familiar conventions for their representation – perspective being the most common in the West. The art historian Martin Kemp (1990) suggests this may be because most of us have grown up with a ‘normal variety’ of (Western) visual experiences – acculturated to some form of perspectival viewing, at least by, television, cinema, photography etc. This brings us to an obvious question, raised by Kemp (1990, p334): whether perspective is merely “an artificial convention based on a manner of ‘seeing’ peculiar to a particular period” or follows some laws about the way we ‘actually see’ the world that was waiting to be discovered (like Newton’s prism splitting light to reveal the colour spectrum).

Despite the views of philosophers, psychologists, physiologists, art historians, and other theorists, the question posed by Kemp is still largely unresolved. Indeed, the psychologist James Gibson sees the debate as flawed. In his theory of ‘ecological optics’ he prefers not to make a distinction between what is seen in the physical world and what is depicted in a picture of it; that these are distinctly different ways of seeing; that there is a difference between the visual field (sensation) and the visual world (perception), yet the same processes lead to a similar perception due to occlusion, and so on. On the other hand, the psychologists Deregowski (1972) and Gregory (1966), subscribing to the notion of perspective as a convention, refer to the apparent learning involved in the ‘reading’ of a perspective. Based on the Hudson Depth Perception test\(^2\), they suggest it is fortunate that perspective was invented before the camera, otherwise, we would only see photographs as weird distortions (Talbot, 1995). In this sense, the photograph could be seen as merely the chemical fixing of the perspectival methodology that preceded it (Kubovy, 1989).

\(^2\) The Hudson Depth Perception test – which tests recognition of objects at different depths in a perspective image – was conducted with remote African tribal peoples who, it was claimed, had little or no prior exposure to Western perspective imagery.
While a shift in sociological conditions occurred during the Renaissance – the rise of rationalistic merchant capitalism – from which the conditions were then appropriate to ‘discover’ or ‘invent’ a method for mimicking how one could see the world through a window, divided by a grid, like the establishment of a language, it may simply be that the conventionalised perspectival way of seeing was formulated and appropriated as a style. Hence, as styles merely follow conventions, perspective can be thought of as a ‘style’. A style that has been dominant in the West for at least the last seven centuries.

6 Cultural Alternatives to Perspectival Representation

If, for a moment, we adopt the notion that perspective is but one style among many potentially dominant styles of spatial representation we notice that cultural perceptions about how to represent the world clearly differ from region to region. For example: India has its isometric representation for which a convention exists within a regional psyche for its interpretation (see figure 2); China, on the other hand, adopts a similar technique often in the form of a scroll, which is as much about describing a story with visual clues as it is about depicting a real scene (see figure 3); Japan extends the Chinese scroll by adapting it to an unfolding screen. In so doing, it gains both literal and metaphorical depth (see figure 4); Mesoamerican (Aztec, Mayan, and Incan) art communicates space of cosmic scale in the form of elaborate two-dimensional chartings or mappings often completely filling the surface they are applied to (see figure 5); Australian aborigines hold memories in a virtual space described through abstract dot paintings, dance and song. With few material possessions and no written language, Australia’s Aborigines impart their subconscious ethereal landscapes by projecting them onto the physical world (see figure 6); and, in a similar manner, the ritualistic art of indigenous Africans and Oceania communicates their spatial narratives through carvings, weavings, assemblages, ceremonies, song, dance, and so on (see figure 7 & 8). Despite being far from an exhaustive overview, and an overgeneralisation, of culturally alternate spatial representation in art, few of these diverse methods are discussed in the literature on spatial representation. Most discussion is primarily from a narrow Western ontological ‘point of view’, which tends to facilitate the perpetuation of popular (mis)understandings of spatial media in the West. The sheer ubiquity of perspectival imagery tends to eclipse investigation of alternate forms of visual communication.

Hence, what we can gain from accepting perspective as merely a stylistic convention is a better understanding of the dominant role perspectival technologies have played in a subtle but effective global homogenisation of alternate forms of visual communication. Within the paradigmatic framework of this convention is the flattening of the scopic field. So powerful is this convention that a brief survey of contemporary versions of traditional indigenous art forms suggests the cataloguing, recording, indexing, and ultimately commodification of indigenous forms of spatial expression – raised carving, impressions in sand, elaborate weavings, assemblages, castings, and masks – has undergone a transition to two-dimensional or flattened, printed, photographed, dyed-on-cloth versions. Such re-productions more easily fit the commodifying interests of collectors, tourists, museums,
researchers and so on. This tells us much about both the inherent reliance on two-dimensional recoding media in the West – TV, print, film and so on – and the apparent intransmutability of such art. For, according to some anthropologists, ethnographers, and artists (Inglis, 1999; Willett, 2002; Bardon, 1979), the iconological cultural quality of the original seems, nevertheless, to be preserved in the media transformation. Like the various transformations a perspective can go through – sketch, photograph, 3D computer model, and so on – it seems culturally alternate encodings of a particular style or convention are similarly preserved.

Figure 2. Both these images are god-pictures of Radha visiting Krishna. The one on the left is from the early eighteenth century (Goetz, 1964, p237) while the one on the right is a contemporary version (www.exoticindiaart.com, Dec, 2004) – note the background landscape scene and the three-dimensionalising effects of chiaroscuro typical of post-renaissance Western art.

Despite Gombrich’s (2000) assertions that modern methods of reproduction dilute the distinction between sacred images and real things, ethnoraphic analyses of the contemporary media transition of ritualistic imagery suggests their meanings may indeed be retained. For example, the anthropologist Inglis (1999) claims, while India’s isometric ritualistic imagery, particularly of ‘god pictures’ used for worship, have been replaced by more realistic printed chiaroscuro versions their spiritual purpose remains (see figure 2). Aboriginal dot painting was developed in the 1970’s by the intervention of an art teacher (Geoff Bardon) in a remote Australian outback aboriginal community. He was responding to the need for a more permanent record of the traditional practice of desert-sand-impression painting (similar in ritual purpose to the Hindu and Buddhist sand mandalas). With clear organising strategies, the impressions in sand map local topological landscape features which resonate a spiritual significance for aboriginal culture. Loosely likened to an aerial view, they constitute a particular kind of spatial narrative ordinarily only available to those initiated into its meanings. Having been carried over to acrylic on canvas and other surfaces (see figure 6), as a cultural ‘style’, it seems to have survived the transition to a more permanent ‘iconographical’ medium. Whether it has lost its original, ceremonial, spiritual, ritualistic, transitory, ethereal meanings remains problematic, however (Bardon, 1979). Similarly, there has been an apparently unaffected shift in traditional African sculpture motifs to their
contemporary production as wax-resistant dyed batik cloths for the Western market (Willett, 2002).

Figure 3. The Chinese scroll, among other forms of artistic spatial expression (such as the vertical scroll, prints, textiles and so on), anticipates a level of interaction which is missing in the Renaissance perspective. The viewer is actively engaged with the process of unravelling the story therewith contained. There is a specific hierarchical order in unravelling the scroll from right to left. Foreground and background elements are often delineated by a shrouding cloud or waterway (Taiwan National Palace, 1991).

Typically, these ethnographic analyses of traditional art base their assumptions on identifying the semantic information available (logical, structured, enunciable, translatable). However, while semantic information helps us to understand art we are not familiar with, it does not help us to appreciate its aesthetic meanings, which are generally untranslatable (Schwimmer, 1990). Hence, the difficulty in making any direct comparisons with Western perspectival spatial conventions.

Figure 4. The Japanese folding screen extends the Chinese scroll. Their use of golden clouds and form to delineate foreground from background is more stylised than the Chinese and is an intentional device in disruption of the narrative (The Tokugawa Art Museum, 2000, Japanese Traditional Sports Expressed in Works of Art, Nagoya, pp76-77).

What we can do, however, is apply the anthropologists’ methods to Western art. In his Structure of Anthropology, Levi-Strauss (1983) clearly differentiates between semantic and aesthetic analysis. Semantic analysis, he claims, has to do with the translatable relations between the perceptual signs that a particular culture may give symbolic value, which ordinarily rely on a simple cathartic response. Aesthetic analysis, on the other hand, has no clearly identifiable semantic value. Such a formulation is only tenable when we assign semantic value the art’s translatability. According to Arnheim (1974), however, the translatability of art is a function of the aesthetic education of the
perceiver. Yet despite these hermeneutical approaches to the study of ritualistic art forms – what the ideological meaning of ritual symbols ‘stand for’ – there remains much which simply cannot be translated. What artists contribute to the translatability of an aesthetic artefact is their ability to see the contradictions in their own cultural system and to express the inexpressible (Schwimmer, 1990). It is only when the conventions used to express the inexpressible is untranslatable that we find the need to learn their cultural specificities. In the case of Western Renaissance perspective techniques Damisch (1991), Panofsky (1991), Romanysyn (1992), and others have much to say about the culturally symbolic meanings its earliest artists gave it. For Damisch, this includes the self reflective positioning of Brunelleschi’s peep-hole opposite a mirror which places the viewer in the painting thus preserving the remnants of the medieval notion of humanity’s place in the world, not extant to it. Damisch also discusses the symbolic continuity of Brunelleschi’s concept by the placing of various figures in doorways at the centre of projection in works by subsequent artists such as the Urbino panels and so on (see Damisch, 1991). What this tells us is that while at one time perspective appears to have represented a strong cultural identity with the society that used it to reflect their spiritual ideals, today it is difficult to find such a clear link with our own cultural identity (Panofsky, 1991). Although it could be argued that the very absence of a clear symbolic link (particularly within a computer-generated perspective) is itself symptomatic of this spiritual vacuum (Romanysyn, 1992). Such a view, as espoused by Heim (1995), is manifest in the seekings of the ‘new age’ spiritual movements.

Figure 5. Pre-Columbian Mexican (Aztec, Mayan, or Incan) art was about a cosmic space delineated between sky and earth. Spatality within the image itself was avoided, such as overlapping and so on. Space in the image was completely filled up – large empty spaces would have suggested nothingness, chaos, and poor design. Their spatial concept was topographic rather than illusionist – charted as on a map (Pasztor, 1983).

So strong was the perceived spiritual link in the symbolism of the Renaissance perspective that sixteenth century Western European Christian missionaries wanted others to believe that their geometrised perspectival view of the world replicated the “same essential, underlying structure of reality that God had conceived at the moment of Creation” (Edgerton, 1991, p289). The standardised procedures of Renaissance perspective had prompted a
fundamental difference in the way not only the West looked at pictures compared to the rest of the world, but how the conception of a physical reality could be arrived at in the first place. Every literate person who desired to succeed in technology and science learned to read the new, scalable, drawings by comprehending their perspectival conventions. These are the same conventions that today’s architecture and engineering 3D drawings rely on.

Figure 6. Traditional sand-painting in the early twentieth century (Strehlow, 1968, p24). Nancy Noonju’s contemporary dot painting, Waterholes at Cherubun Station, shows a popular camping place where there are waterholes providing fish and drinking water (www.aboriginalartonline.com, Sep, 2000).

Despite the missionarys’ attempts to impose their world-view on other cultures they found local cultural styles or symbolic forms were often too strong to be automatically superseded by the Western Renaissance perspective. As a convention or style, Renaissance perspective was not as readily translatable by other cultures as they had believed.

Figure 7. African batik (Willett, 2002, p235), and Figure 8. The primitive arts from the pacific islands including Papuan, Maori, Micronesian, Polynesian, and so on are associated with initiation and other ceremonies which communicate their spatial narratives in real-time (www.janeresture.com/png_art, Dec, 2004).

For example, unlike a Renaissance perspective, traditional Chinese drawings lack the geometric scale relationships familiar to Westerners. Any semblance
of a rigid isometry is illusory. In Chinese isometry there is no strict adherence to projected angles. The angle which effects the best view is used regardless of notions of a correct ‘overall’ geometrical relationship (see figure 9). Also, philosophically, Chinese drawings never reveal the physical structure of Nature the way a perspective does. Sixteenth-century missionaries’ attempts to align the Chinese with their educated views of the world and that of a perspective were largely unsuccessful. The Chinese’ cultural awareness of Nature and their place in it was not dictated by their pictorial analysis of it. This was in contradiction to Renaissance perspective renderings which were used to express cultural awareness of Nature as a ‘thing’ to be observed (Perez-Gomez & Pelletier, 1997).

![Figure 9. Tricks are used in a Chinese scroll to satisfy the roaming eye that what they see is consistent with how the world is seen. In this example, when our eye wanders over the bridge we find the houses marching off to the left as one would expect but on our right we find a house with its side facing us, and across the road we can see that the house on the corner has its roof cantered in both directions. Both situations are designed to fit our spatial expectations (detail from the Hockney and Hass (1988) video, A Day on the Grand Canal, British Film Institute, England).](image)

7 Conclusion

Underpinning the notion of perspective as universally accessible was and still is the West’s reliance on perspective as a manner for communicating a neutral visual truth. Edgerton (1991) claims that, in time, Western Renaissance art has influenced non-Western cultures because it works more convincingly – more like natural perception – than traditional, locally accepted representations. But, as we have seen in the two-dimensionalisation of various regional spatial representations, hybrid adaptations are possible – without disruption to underlying cultural understandings. The influence of African sculpture on Picasso, Matisse and others after the 1900 exhibition in Paris; Japanese prints on the impressionists around the same time, and so on, also comes to mind. Despite the obvious cross-cultural exigencies this implies, today’s ‘press’ still use their perspectival media to claim a neutral viewpoint (Hockney, 2001).

This convincing neutral (value-free) viewpoint is what Coyne (1995) describes as a contemporary rationalistic orientation which supports such technologies
as largely a matter of ‘interface’ – we have become so unavoidably engaged by perspective’s power that we are numbed to its effects. According to Winograd and Flores (1988, p32), however, “there is no neutral viewpoint from which we can see our beliefs as things, since we always operate within the framework they provide.” Hence, the power of the perspectival image as a universal, neutral, method for configuring and constructing the world – not merely representing it – may after all be simply based on Edgerton’s (1991) erroneous assumption that everyone possesses the power to recognise it.

Hence, while the use of a three-coordinate Cartesian spatial model continues to dominate the way architects and engineers make mathematically precise representations of their environments there appears no need to explore alternate styles or conventions. But as is demonstrated by Duchamp’s non-mimetic indexical representation, the unfolding narrative of a Chinese isometric-like scroll, Aboriginal dot painting, and so on, clearly historically and culturally valid alternatives exist and are equally efficacious in communicating spatial concepts regarding how the world can be perceived. What new avenues of spatial representation could we discover from better understanding their conventions?

Recent developments in programmable CAD go some way towards addressing this need for an extension within the existing paradigm. Unlike Brunelleschi’s ‘imaginings’, CAD can facilitate the realisation of structures too complex to be imagined whole. This is evidenced by the work of architects and engineers such as: Frank Gehry’s (1997) non-orthogonal, abstract, free-form Guggenheim Museum, Bilbao; Nicholas Grimshaw and Partners’ (1993) parametrically-determined, sweeping-arched, Terminal at Waterloo, London; Prof. Mark Burry and associates’ (1978-2004) CAD-wise reverse engineering of built and unbuilt parts of Antonio Gaudi’s Sagrada Familia, Barcelona, and so on. These works, nevertheless, still continue to contribute to the almost mythical power of projective geometry as a manner for organising the visual world. The outcomes of these configurations are bound by the strictures of their three-dimensional representation. In other words, the omnipotent conventions of 3D CAD representation, although seemingly able to offer up an inexhaustible array of alternatives within a singular framework, continues to inhibit exploration outside its own paradigm.

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