The image: print and pixel

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The four papers in this edition, with their introduction by Marc Trieb, approach the impact of digital imagery on architecture from many angles; yet they leave a few important stones unturned. I would like uncover a few more of these, and propose a broader framework for discussing architectural imagery in the digital age.

The authors write from the point of view of teachers and historians. With only a couple of exceptions the images they discuss are pre-exisiting, and made after the buildings they depict have been constructed. In their consideration of the impact of the digital revolution they focus mainly on reprographics – using and publishing images made by others in the context of a lecture, a book, an exhibition or an interpretation centre – and do not engage so much with the process of originating images, or making them work for their living.

If we were to take a broader look at how images are used in architecture, we can identify several quite distinct roles, the most common of which I would summarise as follows: a) *originating*, b) *testing*, c) *persuading*, d) *instructing*, e) *promoting*, f) *explaining* and g) *recording*. I'll try to explain briefly what these roles are, and go on to discuss how different forms of digital image making (pixels are not the whole story) are impacting each.

The first five are absolutely typical of the progress of a job through an old-fashioned architect's office. Freehand preliminary sketches are used to *originate* ideas. Then there is a move to a more rigorous hard-line, scaled drawing, which allows ideas to be *tested* and developed with geometrical consistency. In most cases the next phase is to produce perspectives and renderings whose function is to *persuade* outsiders that the job should go ahead – competition jury, clients, neighbours, planning authorities and potential occupants.

If the persuasion is successful, there will be more development, and then the production drawings, whose purpose is to *instruct* the contractor, what Lutyens called "a letter to the builder, telling him exactly what you want him to do." After construction there is often a flurry of activity to generate graphics for publication –

both drawings and photography - whose purpose is to *promote* the designers, enhancing their standing and attracting future clients.

The other two categories are slightly less routine. Survey drawings (as of a site or a completed building) serve to *record* what is there. Then there are many didactic drawings and diagrams used to *explain* the intentions behind a design; possibly made much later by historians and critics rather than the original architect. A hybrid case is the *reconstruction* drawing which mixes recording of what is there with an explanation of what is missing.

If we look through the great early-modern books we can see that most of the illustrations are explanations (of how to detail or proportion something) or reconstructions (of ancient buildings), usually with a good admixture of self-promotion. Palladio has all three, as does Piranesi (Adams fig 8-10), who made his living from a specialised form of record drawing as a *souvenir.* Designed to catch the eye and draw it in with fine detail and narrative content, it gave the grand-tourist of the 18th century an *aide-memoir* to bring home; serving much the same purpose as the modern picture-postcard (Adams fig 12).

Looking through the four papers, I see only two images that come from within a design process – all the others are after the event. One is the Wren/Hawksmoor study of a detail of St Paul's (Adams fig 1), the other from MVRDV (Figueiredo figs11-12). Each is interesting in a different way.

Nicholas Adams complains that the Hawksmoor drawing was both upstaged and misrepresented in an exhibition from the Oxford Science Museum by a computer animation.[1] I would argue that they are not in any way equivalent images; if the role of each is understood through the classification above; they can each be appreciated as excellent in their own way. Hawksmoor's drawing is an exemplar of the second role, to test and develop. It contains a plan, an elevation and two sections, with inadequate clues as to how they fit together. It is not at all an easy drawing to read, even for experts such as Adams and Beltramini (the missing half-column that they complain of is actually on the level below, as can be seen by close inspection of the section, and the way the plan outlines are hatched). But its purpose is not communication; it is the working out of a design, as can be seen from the erasures and crossings-out that it contains. The working out is in three dimensions drawn

[1] I have a vested interest to defend here, as this animation was one of two produced by myself and John Tredinnick in our research group at the University of Bath.

separately but conceived simultaneously, an early but completely confident use of "descriptive geometry" eighty years before Monge got the credit for inventing it. The computer animation is in a completely different category – that of explanation. It makes absolutely no contribution to the design of St Paul's. It isn't working out or testing anything. Instead it shows how Hawksmoor's independent views fit together, and what each one contributes to the three-dimensional whole. It uses animation – a sequence of movements, changes of viewpoint and changes of emphasis – to tell a story. It does it very much better than I could in words, so I won't try, but urge you to have a look (cf Adams note 6).

The digital techniques relevant to architectural imagery fall into two broad divisions – the image-based, where pixels are the fundamental unit of representation, and the vector-based, which utilises points, lines, planes, surfaces and solids to represent geometrical forms. To students, these are epitomised as "photoshop" and "cad". Each can represent static images, or be extended in the time domain in linear (eg slide-show, video) or non-linear (hypertext, virtual reality, computer game) forms.

The two basic ideas, image and vector based graphics, came into use into the 1980s, but made little difference initially, for two reasons; they were very expensive, and they did their best to imitate existing procedures. Pixels got into the print business in 1979, with the advent of the Scitex colour pre-press system, a full decade before Photoshop brought the idea to a wider public. It replaced certain process-photography operations, taking as input a colour photograph, and giving as output separation plates ready for printing. It has left a legacy of old-fashioned print-shop terminology still to be found in Photoshop: cut and paste, crop, dodge, burn, airbrush, spot, unsharp mask. Similarly the early CAD systems did their best to imitate operations on a drawing board. It is only slowly that the potential for doing things differently has become apparent and exploitable; a process which is very far from complete.

Digital image-making has had little impact on the first role – origination. Sketching on paper is still preferred across all kinds of media, from cinema to architecture. Images for test and development are the most interesting area for CAD nowadays, with significantly new possibilities, like constraint-based and parametric design

becoming prominent. Drawings for instruction (working drawings) were the original and still dominant use of the most basic kinds of vector graphics. Images intended for explanation can use all and any methods, but benefit particularly from animation, as discussed above.

The production of persuasive images has become the most elaborate and artful application of cgi (computer generated imagery) in architecture, using all the techniques in combination, and touches on many of the issues that surface in the papers; what are the biggest impacts of the digital revolution, what kind of imagery best represents architecture, and the question of fakery.

The revolution in reprographics has three aspects. Digital cameras have removed the cost of film-stock and processing, leading to an uninhibited orgy of image capture. Effective image compression, storage technology and network bandwidth make the results accessible globally. And printing and display techniques can be found to work at any scale from the microscopic to the urban. The resulting deluge of not necessarily well-judged imagery is the most obvious impact, but may not be the most significant.

A more profound consequence of the revolution is that images become infinitely malleable, in ways beyond imagination in the days of wet photography. Already in 1992 Bill Mitchell (in *The Reconfigured Eye*) was able to write that image editing had destroyed the “unassailably probative” value that photography had acquired over 150 years. Of course there had always been a degree of staging and airbrushing in conventional photography (Stalin and Le Corbusier both using it for their own forms of propaganda), but we have now reached the point where every professionally produced image or video that you see has been reworked, sometimes drastically. Images are “remixed” as freely as soundtracks. And some of the new techniques, like image warping, though imagined long ago (see Durer, D’Arcy Thompson), have only now become routine.

This remixing reaches extraordinary levels in producing a persuasive architectural image. For example, an unconstructed building will be modelled using vector techniques, and the resulting surfaces textured with photographs of real building materials (a form of image warping). This will be rendered to give the effect of

sunlight and shadow, and the result be collaged with heavily doctored photographs (probably taken separately) of the surrounding context and a sky. Entourage like people and trees will be more collaged photography, while vehicles and street furniture are more likely to be synthesized from vector models. Objects seen through glass, and others seen in reflection, will probably be rendered separately, and the images mixed to give a final balance. It is likely that every single pixel will in some way be derived from one or more captured images, and it would not be unusual for fifty or more individual photos to be contributing something to the mix.

There is something very curious going on here. The aim is to make an image that looks like a photograph – the technique is called photorealism. Yet this is being done just as cgi has destroyed the "probative value" of photorealistic imagery. Furthermore, prior to cgi, there was no tradition of architectural imagery imitating photography. In fact rather the other way around; architectural photography imitated architectural graphics, using special equipment to achieve a two-point perspective with the horizon one third of the way up, long exposures with tiny apertures to eliminate passers-by and give uniformly high detail and depth of field, orange filters to exaggerate the sky, and so on. Architectural graphics for their part were set-up on a drawing board, with tee-square and triangle (hence the two-point perspective), and rendered using illustrators media (pencil, pen and ink, pen and wash) and using all the illustrator's skills of modulating emphasis and level of detail to direct attention to the subject.

It is clear from Adams and Figueiredo that architecture makes a good subject for photographs, but as Treib points out, the photograph (or any kind of perspective on a plane) does a rather partial job of conveying architecture. It can cope with surface detail and texture, sometimes does brilliantly with light and shade, but struggles with mass, and fails to convey interior space at all. I am sure most people who have studied architectural history will have experienced the intense surprise of visiting a renowned building known previously only from grey lecture slides filched from Pevsner's *Outline of European Architecture* – Perigueux, Notre Dame, San Vitale – and realising suddenly what all the fuss was about. And somehow the scale was always bigger or smaller than expected. The basic point of architecture is immersion, it cannot be appreciated without it, and the photographic medium does not provide it.

The great perspectivists (and Piranesi *par excellence*) as Adams discusses, mitigated this problem by using fine detail and internal incidents to draw the eye into the picture – encouraging prolonged exploration, even the use of a magnifier. This ability to "zoom-in" is found in one interesting digital form – the QTVR Panorama. I share Adams enthusiasm for this low-tech form which is straightforward to capture with a camera or synthesize by cgi, requires only a web-browser to display, and provides a limited but still appreciable sense of immersion. Based on advanced use of image warping, the first panoramas were made by "stitching" a sequence of photos taken as the camera pans around a fixed viewpoint. Nowadays it is possible to capture the whole set simultaneously, either by using the image reflected in a mirror ball, or by using 5 or 6 synchronised cameras oriented to the faces of a cube. New opportunities open if the cameras capture video. Moving the camera as it works captures a sequence of panoramas extended along a line; this is how Google Street View works. Alternatively the camera can be left more or less in place to record live action in the round, producing an immersive panoramic video. With synchronized surround-sound this could provide a new level of immersion, specially suited to the recording of architectural subjects.

The degree of immersion felt depends on how the imagery is presented; restricted on a small screen, considerably improved if projected at full scale, and improved again if the image is wide-angle, or surrounds the viewer as in an IMAX cinema or virtual-reality cave. However even the small screen version compensates for the lack of peripheral vision to some degree, by allowing the viewer to shift the angle of view.

In the case of unbuilt architecture it is possible to synthesise panoramic imagery, and even panoramic video, though it is not very likely to happen, as the same effort (and it is substantial) could yield a fully interactive non-linear immersive experience – in other words a 3D computer game if it is on a small screen, a virtual reality experience if it is projected so as to fill the peripheral vision. The difference is that the viewpoint can be moved freely in the interactive space, while in the panorama only those viewpoints that have been recorded are available. This makes the space explorable, and enhances the feeling of immersion by giving additional visual cues, particularly motion parallax. I have no doubt that this kind of imagery best conveys architecture, in the sense of reducing the level of surprise felt on entering the real building.

These are the technologies applied in a rough but non-linear way to computer games, and with the highest degree of finish to linear Hollywood cgi spectaculars. It is noticeable how much longer the credits are for a film made this way; the modern fake photography is much more labour intensive than the old photographic fakery. In the architectural world non-linear representations are just beginning to be seen, more often for archaeological reconstruction than in the course of practice. Apart from expense, the persuasive image or video is required to maintain tight control over what is seen, and in what order, and allowing the viewers freedom to range over a project in their own way is feared to be counter-productive.