THE DXI EXPERIENCE

TEN YEARS OF DESIGN VISUALISATION DEVELOPMENTS IN AN EDUCATIONAL LABORATORY CONTEXT

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Introduction

Design *visualisation* is an essential aspect of virtually every form of design enquiry.
The *effects* of potential environmental interventions may be *simulated* in order to gain the types of insights, which cannot be acquired easily from two-dimensional notations.

Three-dimensional representations may be generated for very different reasons. The most direct form of design *imaging* is traditionally for the benefit of the designer him/herself, in order to *test* whether the working concepts offer fitting solutions to the complex array of design *conditions* such as context, programme and feasibility. Alternately, images may be generated for the benefit of *communication*, in order to offer insights into the expected *workings* of a particular proposal (possibly including alternatives). This may lead to greater understanding and possibly to reaching consensus amongst different 'actors' involved in the design and realisation process. In many cases the results of such visualisation studies contribute to 'bridging the gap' between the professionals and other parties involved more *indirectly* in design decision-making or the appraisal of the proposals.

Designers can use distinctly different *methods* when going about such imaging procedures. Their choices for particular techniques may depend on their familiarity or the availability of certain media devices. Being confronted with new modelling and/or visualisation instruments can stimulate the interest in fresh approaches.
In this respect, the design *education* environment can play an important role in not only *teaching* 'proven' applications to future designers, but also in creating a platform for the active development of innovative approaches to the design visualisation practices: education as a 'laboratory' for *new* insights and potentially a 'breeding ground' for the extension of the designer's *instrumentation*.

This contribution documents the experiences gained in some ten years within an educational application, involving active use of design driven media applications. The emphasis lies on the evolvement of techniques for *eye-level* imaging, whereby use can be made of different types of *models*: physical scale models as well as digital, virtual models.
Changing attitudes towards dynamic and serial vision are considered, whereby storyboard approaches on the level of integral presentation are considered. By analysing a selection of cases and their underlying approaches an indication is given of the changing attitudes and combinations of multi-media techniques, which offer opportunities to design visualisation and communication.

The DXI Module

Some ten years ago the Form and Media Studies section of the faculty of Architecture in Delft made a start with a multidisciplinary, free choice education module. The module was intended for students in what has now become the MSc phase, in other words shortly before the commencement of their

diploma year. The idea behind the integrated Media module – which was to last eight consecutive weeks – was that students would learn to use and combine design and presentation *media* for the benefit professional project presentations.

In the module students would develop and apply *skills* in different media techniques – notably: freehand drawing and physical rendering, photography, video and endoscopy, computer modelling – as well as reflecting upon the formal and thematic contents of the project at hand – notably through Form Studies workshops and project presentation counselling sessions. These tutoring sessions culminate in two days of individual presentations in front of all of the participants. The presentation and a project booklet are both judged by the group's tutors.

When the proposal for a (multi-) media module was accepted, there were already ten 'choice' modules, which had been formalised (each denoted by a letter D and a number), so the Media module became D11 ("D-eleven"), here indicated as project DXI.

From the outset the module was intended to be an international one (with a standard ratio of 50% local students and 50% foreign visitors, with English as the common language), which quickly became a hit with students from across Europe (and occasionally the Americas) participating in the Erasmus exchange programme.

Eyelevel Imaging in Design and Presentation

Eyelevel and dynamic perspective visualisation has always been an important item in the module.

One of the most proven methods is through the skilful appliance of freehand *perspective* drawing. A compact, concise course involving different drawing techniques and physical rendering applications has formed an integral part of the module from the beginning, and does so to this day.

Another approach involved physical modelling (essentially by building scale models in the faculty's model making facilities) and optical endoscopy. Another technique – which was emerging at the beginning of the module's existence, involved the development and (dynamic) visualisation of *digital* models.

These different aspects of eyelevel visualisation using physical *and* digital *models* – and their developments over the years – form the central issues of consideration in the following paragraphs.

Design and Presentation Modelling

The construction of models is an activity, which is of benefit for both design study and presentation. Building a model is an intellectual *and* tactile experience: a building process, in a 'scaled down' form.

When building a model the designer needs to make decisions concerning the kinds of *reductions* that are required. In addition he/she needs to be aware of the *intentions*, of the aim for which the model is being built, and how it will be used. As such, there needs to be clarity about issues that need to be emphasised or may be simplified, or even left out altogether.

When modelling for eyelevel representation – such as with optical endoscopy or photography – the model may be considered like a film set in a studio: only those aspects, which need to be shown, need to be modelled. This aspect is not only of relevance in physical modelling, but also holds for other forms of spatial simulation, such as computer animations. In addition a model may be consciously developed for different purposes. For instance the model may be presentable as a whole, but may

also be 'deconstructed' to a certain extent, to show particular aspects, such as the load bearing structure or interior spaces. By making certain parts removable.

Physical Modelling and Optical Endoscopy

As a follow-up to previous exercises, where endoscopy had been used actively in video presentations, a workshop was introduced - the DXI module which coupled a model making exercise with an endoscopic study, in the context of a video presentation.[i]

In addition, the EAEA platform gave an impulse to the use of the existing endoscope. The models (both physical and digital), which were specially created for the Vienna conference workshop[ii], were used in an experimental educational workshop within the D11 module and subsequently documented.[iii]

The experience gained in these activities gave rise to the Imaging Imagination workshop initiative, an extension of a first year Form Studies exercise, which became an integral part of the 1997 EAEA conference in Delft.[iv]

An alternative course was followed in a subsequent experimental design study workshop: A Room with a View. This exercise involved the adaptation of interior spaces, modelled very simply and in a relatively large size (i.e. small scale), whereby design proposals were studied using a miniature video camera.[v] This exercise gave an impulse to interior modelling, with digital 'post production'.

Although the use of dynamic – optical – endoscopy has in recent years become less popular with students (partly due to the enormous amount of time involved in the building of large urban models), eye level visualisation using larger – interior – models has gained prominence.

Digital Imaging Experimentation in an Educational Setting

When the DXI module began the students worked with 3D-Studio version 3, at first with Commodore computers with very limited capacity. The emphasis lay on 3D modelling, with the computer interface consisting of different parts for modelling, animation etc.

The opportunities for rendering were not terribly exciting: texture mapping was used occasionally. Lighting possibilities were limited, without reflection or other effects. What was also missing was the use of proper backgrounds, etc. The 3D models simply lay on empty planes, the best situation effects being some sky with cloud(s) behind the windows.

After having worked extensively with version 4, 3D-Studio Max was introduced.

Rendering was improved considerably, as well as camera movement, facilitating the use of bitmap backgrounds in combination with model views. In addition, *atmospheric* effects were introduced: a combination of size reduction and colour saturation or 'volume light' (a simulation of visible light beams due to dust particles in the atmosphere etc.). All of these attributes helped to enhance the experience of depth.

Versions 3 and 4 did possess elementary ray-tracing options, necessary to create sharp edged shadows, reflection etc. However, the available computers were not really up to the heavy rendering, which was required. Photoshop had not yet been introduced into the faculty's Cad studios, however some students used photo-editing software on their private computers. Gradually PowerPoint

presentations found their way into the module, which introduced integrated schemes, titles etc., but generally slide presentations were still the norm.

Animations, or sections of animation, had to be translated to analogue videotape using a converter connected to the computer. To get a complete piece of 'film', separate scenes had to be prepared and translated step by step to video using the pause settings. As may be expected the video quality was frequently far from optimal. In some cases an analogue video film montage was made, sometimes using different types of images, in combination with a soundtrack.

Developments in Virtual Modelling and Multimedia Presentation

In the mid nineties Max was already a considerable improvement. The screen interface used an integrated lay-out (similar to that of Maya), whereby all kinds of aspects could be activated. In addition Lightscape was installed. This programme was developed specially to compute the lighting characteristics of a model, including the diffuse light reflected by surfaces of different materials, using *radiosity*. After all the intensive modelling, most students only have limited time for rendering at the end of the period, which means that most do not get around to applying Lightscape. Nonetheless some students have focused on the possibilities of this type of software, producing very interesting results.

One of the most notable shifts in the module coincided with the introduction of Photoshop.
By working in layers, began to be place in front of a background and (sampled) elements, such as human figures and furnishings were introduced, contributing to a sense of scale and atmosphere…
An additional benefit of photo editing software is that mistakes in the renderings can be retouched or corrected. Another consequence is that model renderings (for instance a top view) can easily be transformed into other design media, such as schemes and digital collages. Images can be combined, varying from abstract, realistic, functional or atmospheric. The use of texts in conjunction with imaging also received a new impulse.
The influx of PowerPoint presentations was clearly an improvement, although the changes between stills were often not subtle and the programme had serious limitations when large files needed to be synchronised (for instance with music).

During the 1999/2000 course, Maya was introduced for computer visualisation. The program brought with it new rendering possibilities, which became visible in the computer exercises which were compulsory for all students. By using NURBS (a type of curve) flowing, spatially complex surfaces could henceforth be modelled and rendered. It became possible to render only parts of an object and, after alterations, to create new renderings effectively. Due to the improved rendering time variations in colour and material could de tested and evaluated relatively easily, leading to improved imagery.
The LIVE module of Maya makes it possible to render an animation in conjunction with a background film of a chosen situation, in such a way that the digital image can be animated from a changing viewpoint, corresponding with the filmed background. However, this is exacting and time consuming work and the student's work does not always turn out to be satisfactory.
Maya also has a Paint module: Maya Paint Effects. One can draw with the help of the mouse, or better still on a tablet, on a 2D plane, whereby the effects simultaneously become visible in the 3D model. Alternately, it is possible to place fully three-dimensional objects, such as grass and trees into the model.

In principle this works as a 2D surface, but by pulling a line with the mouse a trace of 3D grass of a chosen sort is created virtually. Getting trees to come across more or less realistically is time consuming. Nonetheless, these effects can be particularly convincing in animations, for instance the illusion of the wind blowing through grass and trees.

The introduction of Adobe Premiere brought about a major change. Suddenly dynamic film sequences could be made, using all sorts of images.
The storyline and production quality in the students' presentations became much more professional (changes, sound, titles etc.). Being able to combine still and dynamic sequences means that the filmic qualities of the story being put forward have become more convincing and attractive. The students have 'risen to the occasion'…
An other aspect of this development is all kinds of *physical* information, such as freehand drawings, models and collages may be integrated freely into essentially digital media.
The development of a good storyboard has become more and more important and has become an integral part of the tutoring process.

Next to the filmic – *linear* – storytelling, non-*linear*, interactive modes of communication are gaining prominence. Several programs have been installed which enable the students to work more and more interactively and make Internet base presentations. In these productions several sorts of media and files come together, such as text, stills, animations and movies.

Developments in Physical Modelling and Multimedia Presentation

As has been indicated earlier there has been a gradual, but steady, shift from optical endoscopy in motion to other forms of design visualisation using physical modelling. In the case of the Delft architecture faculty this may partly be due to the institutionalisation of the endoscopic facilities.

Whereas at the beginning of the nineties the faculty endoscope was easily available to students, they now have more difficulty in gaining access to the device. This is partly the result of the intensive refurbishment of the instrument in the mid nineties. This upgrading of the facilities was so costly that henceforth students were only able to use the device under the guidance of an official operator with limited time. The responsibility for the apparatus was split off from the educational departments, who had been active in the implementation as a tool for education, to a less involved, separate *facility management* group.
Whilst earlier on students could spend as many hours as they needed experimenting with the relatively simple (and therefore more or less 'idiot proof') endoscopic device, the 'improved' instrument has steadily been drawing fewer and fewer professional users. This negative development might to certain extent be redressed: by offering interested students a course, whereby they can attain a 'driving licence', whereby they would be free to work individually without unnecessary constraints.

One of the most interesting developments in recent years has come through the introduction of *digital* photography and video with digital output, as well as the introduction of the digital editing software mentioned earlier.[vi]
Many students – those participating in the DXI but also diploma phase students – nowadays are inclined to make digital 'stills' from their presentation models, which they are subsequently able to

'retouch' and 'furnish' using photo editing software. These images can be manipulated for different uses and are frequently presented in 'serial vision' or in combination with other techniques (varying from hand sketch to computer model renderings) in truly *multi*media presentations.

Conclusions

After the initial scepticism, which greeted the initiative, the DXI formula has clearly become a success Parts of this may be due to the concentrated set-up and Group driven activities. By bringing the students together in concentrated working environments, the students are inclined to learn from each other.

This does not only go for the students. It is fair to say that the DXI platform has become a testing ground and development laboratory concerning visualisation and presentation techniques. Learning from one's students…

Another added benefit has been that of collaboration: particularly with the specialised informatics group[vii], whereby the student *assistants* play an important mediating role between staff and students.

Perhaps the most profound development has been the growing tendency towards *mixing* media, both digital and physical. No longer is the question to be asked whether platforms should analogue or digital, it is now a matter finding and applying relevant *combinations* of a great number of physical *and* digital instruments

As far as this is concerned the claim that computers would make other – proven – design and presentation media obsolete has not worked out. On the contrary: physical media have *not* been replaced, but *enriched* by the computation and – vice versa – 'digital' presentations are being 'enlivened' by the introduction of less 'definite', more 'personal' media applications.

What is clear, is that computer-based techniques are not only here to stay, digital formats have as it were become the 'stage' on which all kinds of media can interact. Whereas at the beginning nearly all presentations were made using slides (and a few with video), the introduction of beamers of reasonable price and optical quality have – in a very short time – brought about a complete turnover to digital carriers.

Both the new *and* the proven tools – and various different combinations – continue to offer opportunities for discovery, for eyelevel visualisation as well as other forms of scrutiny and communication.

This path deserves to be continued. The next step may be the implementation of a multiMEDIAlab, which has been proposed by the Form and Media Studies group.

To be continued…

Notes and references

i Jack Breen and Terenja van Dijk, *Modelling for Eye level Composition, Design media experiments in an educational setting*, in: *Architectural and Urban Simulation Techniques in Research and Education, Proceedings of the 3rd European Architectural Endoscopy Association 1997*, Jan van der Does, Jack Breen and Martijn Stellingwerff (eds.), Delft University Press, Delft, 1998.

ii Bob Martens (ed.), *The Future of Endoscopy, Proceedings of the 2nd*, Isis Publications, Vienna, 1996.

iii Jack Breen, *Learning from the (in)visible city, Design media experiments in an educational setting*, in: The Architectural Annual 1996 – 1997, Henco Bekkering et al (eds.), Delft University of Technology, 010 Publishers, Rotterdam, 1998.

iv Jack Breen and Martijn Stellingwerff, *Imaging Imagination*, in: *Architectural and Urban Simulation Techniques in Research and Education, Proceedings of the 3rd European Architectural Endoscopy Association 1997*, Jan van der Does, Jack Breen and Martijn Stellingwerff (eds.), Delft University Press, Delft, 1998.

v Jack Breen, *A Room with a view*, in   …………………..

vi Pioneering work was done by Video lecturer and DXI coordinator Margit Tamas. Although there was initially quite a lot of resistance from the (facility) management to the introduction of – relatively costly – digital devises, the faculty is currently busy upgrading the necessary digital photo and video instrumentation.

vii TO&I – Technical Design and Informatics, responsible for a considerable part of the Delft faculty's ICT curriculum.