# Architecture of the Virtual Place

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*The Bartlett School of Graduate Studies, University College London (UCL), set up the first MSc in Virtual Environments in the UK in 1995. The course aims to synthesise and build on research work undertaken in the arts, architecture, computing and biological sciences in exploring the realms of the creation of digital and virtual immersive spaces. The MSc is concerned primarily with equipping students from design backgrounds with the skills, techniques and theories necessary in the production of virtual environments. The course examines both virtual worlds as prototypes for real urban or built form and, over the last few years, has also developed an increasing interest in the the practice of architecture in purely virtual contexts. The MSc course is embedded in the UK government sponsored Virtual Reality Centre for the Built Environment which is hosted by the Bartlett School of Architecture. This centre involves the UCL departments of architecture, computer science and geography and includes industrial partners from a number of areas concerned with the built environment including architectural practice, surveying and estate management as well as some software companies and the telecoms industry. The first cohort of students graduated in 1997 and predominantly found work in companies working in the new market area of digital media. This paper aims to outline the nature of the course as it stands, examines the new and ever increasing market for designers within digital media and proposes possible future directions for the course.*

## Architecture of the Virtual Place

New areas are opening up in design. The Internet has now permeated western culture and the rapid growth of on-line business is reported regularly. Expansion in this area has coined the term 'new media' in order to express and define the ever increasing interdependence of the industries involved in internet, film, TV, graphic design and 3D design in the provision of predominantly web based entertainment, working and social environments.

Working in the development of New Media involves a general knowledge and skill base in a number of areas with preferably an expert knowledge in one or two. Aspects of New media design can involve an understanding of typography, layout, graphics, narrative, information visualisation, 2D and 3D space design, circulation, body and self, representation, iconography, communication, behaviour, immersion, interface, interactivity and function. As a result New Media developers tend to come from a broad range of backgrounds, not least that of architecture.

Indeed, architectural theoreticians such as Michael Benedikt and William Mitchell have long argued that electronic information space, or cyberspace, with functions such as community, economy, commerce, art and design and recreation , is equally as valid as their real-life cityspace equivalents and these are indeed the sort of spaces that architects should be addressing. The New Media area has opened the door for exactly this type of exploration.

The MSc Virtual Environments course aims to equip students from a design background with the necessary range of skills in order that they are able to seek out opportunities within this area. The course aims to examine the theoretical aspects, construction and creation of virtual functional environments and analyses the relationship of the creation of these spaces with that of conventional architectural design.

Virtual Environments can be constructed at a number of levels – from the immersive headset to the linking of 'real' space via digital multimedia. During the course students undertake a number of practical projects which both reinforce theoretical learning and also introduce the complexities of the software synthesis of virtual environments. The course is taught using a variety of media including lectures, seminars, individual tutorials, workshops, internet, video and interactive multimedia. Students time is structured to facilitate the development of project based research.

## Context

The Graduate School has five main areas of research and the MSc VE course is perceived as a cornerstone within the computer aided architectural design area The MSc course, Phd student study and The VR Centre for the Built Environment are interdependent and mutually supportive of each other.

The VE course is one of 21 taught Masters courses offered at the The Bartlett School of Architecture, Building, Environmental Design and Planning, University College London. The MSc Virtual Environments (VE) course is one of 11 Masters based in the Graduate School of Architecture. The school has around 150 students a year with the maximum intake on the VE course currently being 12 students.

The course is a modular course as is required by the Graduate School. The current course consists of 6 modules of either 10 or 20 credits, totalling 80 credits, with the summer project accounting for an additional 40 credits. Theoretically, within the modular system, from these these 80 approved credits, students must take at least 60 credits from the VE course curriculum, with the additional 20 credits from any other Graduate School Masters course. However, in the last three years, all Virtual Environments (VE) students have taken all modules from the VE syllabus and no student has opted in or out of any VE module. This is likely due to the intense nature of the teaching programme, particularly in the somewhat linear development of practical programming skills.

The course is 12 months in length and consists of 2 x 11 week teaching terms, 3 week examination period and 12 week summer project and dissertation.

### VR Centre for the Built Environment

The course is supported by , and is the teaching arm of,The Virtual Reality Centre for the Built Environment, a DTi and Technology Foresight project. This allows the course to take advantage of research in other disciplines such as computer science, psychology and geography as well as establishing collaboration with associated industries and organisations. The VR Centre industrial partners currently include Advanced Visual Technology, WS Atkins Consultants Ltd, Balfour Beatty, Boots, Bovis Construction Ltd, British Telecom, Building Research Establishment, Division Ltd,ESRI (UK) Ltd, Foster and Partners, Fulcrum Consulting, International Computers Ltd (ICL), Ordnance Survey, Ove Arup & Partners, J Sainsbury plc.

### Phd Study

All Phd students researching any relevant areas of the course are actively encouraged to give lectures, seminars and workshops on the Masters course.

## Teaching Programme

### *Theoretical Discourse*

Most of the introductions to theoretical ideas and related topics are taught in term 1 through two modules:

'Principles of Virtual Environments' (20 credits) examines ideas concerning the definition of a virtual environment, computational models, shared environments and related mathematics.

Areas covered include: Issues in Virtual World Design, particularly representational fundamentals, light and sound in virtual environments and aspects of presence and immersion (fig i) ; Virtual Communities MUDs and MOOs explored through introductory workshops and design project based work (fig ii); and Applied Mathematics covering vectors, matrices, surfaces and so on.

The module 'Space Form Behaviour and Its production' (10 credits) covers the issues of automatic generation of virtual environments and emergent behaviours and includes: Generative Modelling; Information Visualisation and Emergent Behaviour in complex systems.

As a deliberate policy, both of the above modules rely fairly heavily on visiting lecturers. The support of the VR Centre is that there are a number of guaranteed guest lecturers on hand, available to discuss ongoing research projects. In addition to this, our facilities and central London location attract interested visitors from local architectural practice and new media businesses. The majority of these modules are taught within the Graduate School, but there are a number of workshops and seminars supported by researchers in the department of Computer Science and Geography.

In the second term students are asked to undertake a theoretical exploration of a chosen topic in the module 'Theoretical Analysis in Virtual Environments' (10 credits) This module allows for in-depth study into the theoretical basis of the course through the analysis of theories offered through the disciplines of computer science and architecture. The



*Figure i (left). Students undertaking workshops in presence and immersion*

module is taught through individual tutorials and students are asked to submit a 3,000 word paper.

### *Acquisition of Technical Skills*

Technical skills are also developed first of all in term 1 through the module 'Methods on Synthetic Construction 1' (10 credits). This module comprises of workshops in which the students are introduced to the internet and to computer programming through the development of 2 and 3-dimensional internet based functional space. To date the module has emerged from being solely HTML based in 1995/6, to a mix of HTML and VRML teaching and next year will be entirely VRML & Javascript. The students have a total of 10 half day workshops where they undertake a small design project.

The second term sees an increase the students technical programming abilities through the module 'Methods in Synthetic Construction 2' (20 credits)This module introduces students to the process of constructing intelligent virtual environments through more advanced programming skills. A series of workshops equip students with the ability create and explore both immersive and realtime intelligent environments. The programming language and software used in the workshops can change from year to year. Last year we used Division software, with somewhat limited scripting abilities, to enable students to explore immersive environments and C++ with

*Figure ii (right). Project built within an online virtual community*



Cosmo 3D in order to explore more advanced scripting in real-time interactive desktop environments.

Finally, in the short 10 credit module ' Multimedia and its Application' students explore interface design and general multimedia techniques  with particular reference to the 2-dimensional depiction of 3-dimensional form.

### *The Resultant Combination*

Over the third term and summer period students undertake their own personal project. Students  are required to submit a 10,000 word Report on an agreed subject lying within the scope of the syllabus, and involving the design, construction and production of a virtual world. Examples of recent reports include: Exploring form creation with evolutionary design; Communication and spatial configurations;  An exploration of new metaphors in virtual space; Using generative computer modelling to explore the relationship between road systems and the growth of the traditional English village; The effect of form and colour on navigation performance and level of presence in immersive VR (figs iii & iv), A study of the effects of 3D navigation in web based art repreentation (fig v).

A number of these projects, and the students involved in them, have been a catalyst for  Phd research or as research contracts funded by the VR Centres industrial partners. Examples of such projects are: a comparison of virtual and real navigation patterns undertaken  for the Tate Gallery (figs vi and vii), BT sponsored work into the development of a virtual meeting room, avatar representation in 3D space and communication patterns in virtual office design.

The course aims to equip students with a spectrum of skills from the practical to the conceptual. Participants survey a wide range of information technology in order to enhance their ability to participate actively in the use of IT in the built environment and in the New Media arena.  Dealing with subjects as diverse as CAD, artificial intelligence,

dynamic, their application to architecture and built form has until now,by definition, ended in a static product. With the advent of our new and ever developing cybercities, the application of behaviours and AI in the design process need not stop at the production of the building but can exist and continue to inform the functional virtual space throughout its lifetime.

It is with these thoughts in mind that it is planned that near future developments of this course are to include a module in information visualisation to examine how in this information age, we can be aided with the assimilation of information by 3-dimensional space. With a longer view, we hope to start to examine relationships between real and virtual and to explore the development of augmented reality systems. We plan to explore how virtual behaviours and intelligence can be projected into our 'real' buildings and the effect that these developments may have on our knowledge base, communication patterns, in all, the way that we inhabit the buildings we use today.

## Bibliography

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behavioural systems and immersive experiences, students should complete the course having actively experienced and employed a broad range of the art and application of computing in an architectural context.

## The Future

As we all know, most of the actual subjects taught on this course, although hardly prolific, are not new to computer aided architectural design courses. Until now subjects such as generative modelling, behavioural systems and artificial intelligence have been applied to either the architectural design process or the analysis of 'real' cities or buildings in some for or another. Although these systems are in themselves

*Figure v (top right). Online art gallery*

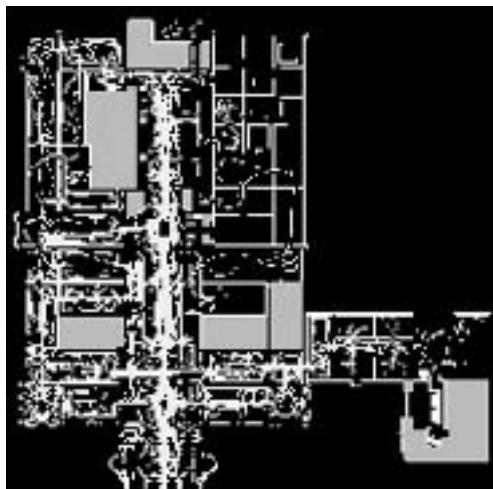*Figure vi (middle right). Tracing circulation in real Tate*

*Figure vii (bottom right). Tracing circulation in virtual Tate*

Zeevi, G. 'The effect of form and colour on navigation performance and level of presence in immersive VR' MSc Report, Department of Architecture, University College London, 1998

## Web References

i. MSc Virtual Environments homepage
http://www.bartlett.ucl.ac.uk/ve/
ii Michael Benedikt homepage
http://mather.ar.utexas.edu/Faculty/benediktf.html

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