V I PA: A virtual campus for virtual space design.

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Abstract. The conceptual design of virtual spaces is creating new places in which to live and work. In consequence, new opportunities for work and employment are opening up for architects as well as for architectural educators. In response to this challenge, VIPA, a transnational virtual campus is currently being developed; it contains an e-learning and research platform for European architectural schools with a focus on virtual space design. The virtual campus integrates administrative, curricular, and communicative infrastructures, interactive, multimedia 3-D contents, and pedagogical considerations in respect of the aims, content and technologies employed.

Virtual campuses are already established at most universities in the European Community, yet surprisingly e-learning is not yet widespread in architectural schools in Europe. E-learning is arguably still in an initial research phase; although there are best practice examples where e-learning is already replacing traditional study forms in other teaching disciplines. However, it has been found that although all the universities involved in the VIPA project have been involved in e-learning projects for many years, there is a considerable resistance to e-learning as being equally effective as traditional face-to-face studio teaching. Given the new virtual conditions of space design however, new contexts for learning are increasingly relevant.

University curricula have developed out of local competencies, networks of teachers and researchers. These local factors need to be woven into the fabric of a transnational VIPA curriculum and supported with organizational layout, platform, user interfaces and their features. Participants will offer existing courses in virtual space design, as well as developing new ones. This offers the option for both present and future participants to adjust the VIPA courseware to suit local curricula demands, while offering a large range of courses and knowledge. An additional feature of VIPA is thus as a platform for curricula development in virtual space design.

The paper reports on the VIPA project's aims, pedagogical problems, solutions, course content and methods; it will describe prototype results from participating universities and include perspectives on its future application.

Keywords. Architectural Education; E-Learning; Virtual Space.

Introduction

The design and implementation of space and place is no longer wholly reliant on physical processes. The conceptual design of virtual spaces is creating new places in which to live and work. In consequence, new opportunities for work and employment are opening up for architects as well as for architectural educators. In response to this challenge, VIPA, a transnational virtual campus is currently being developed; it contains an e-learning and research platform for European architectural schools with a focus on virtual space design. The virtual campus integrates administrative, curricular,

and communicative infrastructures, interactive, multimedia 3-D contents, and pedagogical considerations in respect of the aims, content and technologies employed. The virtual campus, its didactical and technical functionalities as well as its content is being developed by an EU funded consortium comprising an administrative partner, four European architectural faculties, a commercial partner in the field of interactive 3D authoring-tools, and a partner with competencies in the development of e-learning curricula.

At the time of writing (May 2006), using "Virtual Space" as a search term gives over 80 hits on CUMINCAD, while "E-learning" gives 25. The body of research into virtual space indicates the term's common usage in research circles of architectural education and that the influence of virtual space on architectural curricula is already under discussion at many universities. These articles document a wide range of approach and include a number of formulations about spatial and technological relationships, studio programmes, collaborative designs and applications. Despite the proliferation of articles, previous research maintains that there remain many weaknesses in the current applications of virtual space, as with online communities in general: "Environments are static with the exception of visitors who navigate within them. Usually advanced programming skills are needed and only time-based animations of spatial elements are employed. User interaction is limited to point and click and in certain cases proximity sensors trigger events" (Charitos and Bourdakis, 2000). Architectural educators will see these limitations in relation to what is taught and learnt in their curricula; the learning of advanced programming skills is certainly an option in some faculties. The modelling tools used in creating online architectural content generally lag, in ease of use, behind those concurrently offered in architectural schools, but knowledge of underlying programming skills furthers a creative manipulation of the new tools in design tasks. However, teaching architecture is not primarily an instructional process but rather a process of interaction and experience (Herzog and Kühn, 1995). An evaluation of the effectiveness of VIPA's development cannot only focus on the technology itself but should also examine the potential of technology as a tool for learning and design (Strojan and Mullins, 2002). Software for 3D modelling, rendering and animation, combined with multi-user, interactive environments should support a social learning context. It is not that the 'virtual space' in which learning and teaching occurs should only represent the vibrancy of an architectural studio when it is best, but that its application offers new potential for architectural curricula.

VIPA will attempt to address these pedagogical concerns while exploring a set of approaches including cellular automata and genetic programming as tools with which to explore architectural ideas in virtual space (Coates et al., 2001). Given these new conditions for design, new contexts for learning are increasingly relevant.

VIPA Objectives

The overall objective of the project is to expand and enhance education in the field of architecture within a virtual campus through development of pedagogical courseware and appropriate technological platforms. Project goals include:

- A virtual campus integrating administrative, curricular and communicative infrastructures for schools for architecture.
- Competence development in the design of virtual and augmented reality for architecture students.
- Development and coordination of the training of European architecture students in the field of 3D-design

- Use of industrial know-how in the field of interactive 3D-authoring for the training of architects
- Content and conception input for these industries from the field of architecture
- Coordination and research at European architecture universities in this field
- An internationalisation of curricula into joint or double degree developments for architectural students and/or graduates.
- Additional and more intensive cooperation between the respective educational institutions across Europe.

University curricula have developed out of local competencies, networks of teachers and researchers. These local factors need to be woven into the fabric of a transnational VIPA curriculum and supported with organizational layout, platform, user interfaces and their features. It has been therefore proposed that all participants offer their existing courses in virtual space design, as well as developing new ones. This offers the option for both present and future participants to adjust the VIPA courseware to suit local curricula demands, while offering a large range of courses and knowledge. The professional fields that students of these curricula may enter range from well established fields like architectural design or game design to emerging fields like information design and the provision of virtual environments as extensions to existing institutions of complex social networks. An additional feature of VIPA is thus as a platform for curricula development for virtual space design to cope with the demands of a highly multi-disciplinary and emerging field of knowledge.

Didactics and E-Learning

Virtual campuses are already established at most universities in the European Community, yet surprisingly e-learning is not yet widespread in architectural schools in Europe and is arguably still in its initial research phase. One documented example is of WINDS, a research project that aimed to build a comprehensive virtual university for architectural and engineering design. It included 28 partners from 10 European countries (Oxman, 2003). The cognitive strategies implemented and tested in the WINDS project, using the ALE platform, aimed "to achieve synergy between pedagogy and knowledge at the level of the design university by creating a knowledge system out of the multiplicity of courses" (Oxman, 2003). However, the fate of this project is unknown to the present authors as its site page is unavailable. Although there are best practice examples where e-learning is replacing traditional study forms in other teaching disciplines, it has been found in the participating architectural faculties that there is a considerable resistance to e-learning. Among various other concerns, there is a common doubt that e-learning can be as equally effective as traditional face-to-face architectural studio teaching and culture. This is not a problem related only to architectural education and has been addressed in other projects such as OMAET, a pioneer in offering online degree programs for mid-career education professionals (Stager, 2005). Here, learner-centred theories and practices built upon the writings of Vygotsky, Lave, Wenger, Piaget and Papert stress that the course compensates for the lack of face-to-face contact between students and faculty "in ways that actually lead to greater intimacy and access" (Stager, 2005).

The concept of VIPA didactics is based on the constructivist e-learning model. The constructivist learning concept provides prompts, stimuli, coaching and support instead of guiding a student through knowledge and is in that aspect close to established teaching in the field of architecture (and other related sciences). VIPA supports blended learning – the combination of traditional and e-learning practices. In that sense it combines local specifics with the collaborative and sharing possibilities, strengthening the sense of affiliation among its members. VIPA is an environment

which supports problem-oriented, experiential, collaborative learning with media-rich contents based on grounded pedagogical methodologies, with a high grade of interactivity. Learning and teaching of virtual space design stand in the focus of VIPA effort. Combining constructivist and blended learning models, the main virtual campus features are oriented towards creative, intuitive, user-friendly didactical environments and tools.

Administration and Infrastructure

All partners emphasized and agreed that a priority in the VIPA project is the virtual design centre with tools and the collaboration functions for students and staff. Here are some general requirements that virtual lab has to fulfil:

- creating of 3D primitives, mapping and scripting, with simple modular integration of additional tools
- manipulation and modification of objects
- collaborative interaction and modification of spaces and forms (accessible via intra- and internet)
- working on different levels (novice, expert users): in graphic user interface (virtual space), in the scripting terminal or programming language all the while staying and monitoring changes in virtual environment
- personalization of the environment (in the collaborative environment where nothing is private and all is accessible to connected members, there is a strong need for some privacy. Virtual lab should therefore enable participants to withdraw to private space when privacy is wished for)
- interaction with other documents and programs
- import data (especially 3D) from established programs for 3D modelling and design (dxf, 3ds, dwg, etc.)
- the virtual lab has to be prepared with both end users and developers in mind (basic functionalities have to be already present after installation and easily used in VIPA courses).

It has been found that participating universities already operate with one or several e-learning platforms including WebCT and FirstClass. It can be anticipated that, for financial and administrative reasons, it will prove difficult to convince an organization to change its commitment to existing platforms. Therefore the software used to deliver the courseware component must not be tied to any particular management environment. Overall assessment of the virtual campus platforms has therefore been made on the criteria of sustainability, flexibility, and integration. In addition to the requirement of open source software, other software considerations include: the provision of an immersive 3d environment; a scriptable built in language; the allowance of co-presence; an existing large community of users / developers; relatively low levels of technical demand on hardware and operating systems; and portability across operating systems.

After a number of options were examined, a combination of 'Blender' plus 'Uni-Verse', should be used for the first demonstration project, with 'Moodle' as the courseware administration and management component. Blender is open source software for 3D modelling; animation; rendering, and playback (see http://www.blender.org/). Uni-Verse is an open source Internet platform for multi-user; interactive; distributed 3D graphics and 3D acoustic simulation (see http://www.uni-verse.org/). Moodle is an open source package for producing internet-based courses and web sites, designed and developed to support "social constructionist pedagogy" (see http://moodle.org/).

Curriculum and Course Structure

It is proposed to offer a Masters degree organised to follow a 12 month 72 ECTS framework. The programme is structured in three semesters A, B and C (figure 1). Teaching will take place in semesters A and B followed by a semester of independent studies leading to the thesis/report. Semester A and B comprises three modules each 1, 2 and 3 in semester A and modules 4, 5 and 6 in semester B. Modules 1 and 4 Theories of Space, Architecture and Urban Systems and module 2 and 5 Theories of Digital Space delivered as seminars and lectures are 6 ECTS modules. Modules 3 and 6 Design of Virtual Space & Virtual Space Design are project based modules with 12 ECTS each.

Table 1: Prototype course structure

Semester A		Semester B		Semester C
Module 1	Theories of Space, Architecture and Urban Systems I	Module 4	Theories of Space, Architecture and Urban Systems II	Module 7 thesis
Module 2	Theories of Digital Space I	Module 5	Theories of Digital Space II	
Module 3	Design of Virtual Space & Virtual Space Design I	Module 6	Design of Virtual Space & Virtual Space Design II	

The two theory models run in parallel with the project based modules. Within each module options of alternative components are offered from a choice of courses of the partner universities. These options will make different routes within one framework available.

Instead of developing one or more complete 3-D courses with instructions, tasks, etc., which might be difficult to localize and have a limited life-time it is suggested to develop a set of 3-D learning modules, which can be integrated into different learning scenarios. The learning scenarios should be built up with an underlying narrative:

- an introduction: A virtual reality application makes students aware of the possibilities of virtual space design. A sub set of virtual space conditions is described in the context of the software employed. A problem is defined, which should be exciting, surprising, maybe shocking, showing the full potential of virtual space design, allowing the students to the borderlines of what is possible.
- an exploration phase: students gather information both individually and in teams, moderated by a teacher in a collaborative seminar room, further applications, materials they find in the library, on the net, in natural

environments, and share their findings. This can be asynchronous collaboration with occasional synchronous meetings.

- a conceptual learning phase: Here the students learn the hard facts with materials in the virtual library, inputs from teachers, maybe further 3-D or other learning applications. They may also learn to use specific development programs for virtual space design. They will be allocated tasks/problems to be solved with knowledge they acquired so far or with knowledge and learning objects they find on the net, in the library, in real and working life.
- a problem solving design phase: Here the learners solve problems in teams, facilitated with collaborative synchronous and asynchronous learning tools and coached by their teachers in experimental design. Here the learners use all information and knowledge they acquire and develop their own spatial design projects.
- Presentation phase: Design process materials are gathered by teams into report form and published on-line. A final physical meeting is held for presentation in teams, discussion and assessment.
- Course Evaluation: Students and facilitators evaluate the course in terms of its objectives and individual learning outcomes.

Conclusion

VIPA effort is oriented towards development of tools for Virtual Space Design and teaching in that environment. Special emphasis is put on longer term aspects of virtual space, as students will be encouraged to experiment with, design and develop virtual space as a new emerging environment. Virtual lab is considered to be one of the crucial VIPA strengths and is the focus of the VIPA curriculum.

The course should present and enable students to create personal environments, make generic spaces and forms, collaborate, interact and communicate, and experiment with forms and environment responses to user actions.

The strongest points of VIPA platform are: extensibility, modularity, comprehensive services and means of communication among users, towards future oriented tools for e-learning (especially for virtual space design), where partner universities and partners from the private sector may profit by sharing resources, competencies and contact networks.

VIPA is at present a prototype that tests the feasibility of the didactical and technical concepts. Issues still to be addressed include its development into a working model and include:

- Different types of degrees/coursework offered
  - o Part or whole of a MSc.
  - o Coursework in the doctoral degree
  - o MPhil or PhD research platform
- Quality control where VIPA combines courses from various schools
  - o Quality criteria
  - o Choice of evaluators
- The organisation of VIPA as an institution in the future
  - o The CLUSTER consortium is a possible model (www.cluster.org)
  - o The appointment of teaching staff
  - o European accreditation of titles, modules.

Acknowledgements

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