Interactive Spatial Design course analysis

10 years, 150 projects

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Abstract. The paper is giving an overview and analysis of an undergraduate, sixth semester, compulsory course titled “Virtual Reality: Interactive Spatial Design” at the department of Architecture, School of Engineering, University of Thessaly, Volos, Greece. It is one of the very few courses on designing digital/synthetic and interactive space—and not merely utilising Virtual Reality (VR) technologies for architectural visualisations—in architectural curricula. The aim of this paper is to primarily draw on a ten year experience on teaching the course and to open up a discussion on the implications of such digital design courses and address emerging problems. This is achieved through a reflection on the teaching process (interaction as design process, curriculum and attained goals) and an analysis and genre classification of the 150 submitted projects.

Keywords. studio teaching; interaction; virtual environments; digital design.

BACKGROUND
A lot of discussion is taking place lately concerning the potential directions architectural courses should be taking; new areas of expertise are being addressed and their integration within the digital realm is being discussed. Overall, one needs to note a shift from engaging students with hard-core design towards developing their skills with softer design oriented actions (e.g. energy conservation and comfort design as in intelligent environments, digital experience and interaction in mixed media installations, etc.). Although a hard versus soft differentiation endangers a dualism as far as design conception is concerned, based on a decade of experience using varied digital contexts for architectural design, the author argues that current architectural education courses could accommodate more systematically the increasing needs for interactive space design (Bourdakis et al 2002; Fox et al 2009).

The course titled “Virtual Reality: Interactive Spatial Design” is been taught for the last 10 years as a compulsory, four ECTS, semester course at an undergraduate level in the department of Architecture, University of Thessaly, Greece. Enrolment is sixty to seventy students submitting an average of fifteen team projects annually. The course develops and organises content material, lectures and project briefs around two main axes; discussing with students a wide variety of virtual reality experiences and their relevance for spatial design and encouraging students to design digital interactive spatial constructs.
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**COURSE AIM: EXPLORING AND ELABORATING INTERACTIVE SPACE**

Particular aims of the course are to:
- Facilitate exploration and elaboration of the processes related to designing digital interactive spaces
- Enhance students’ abilities to control aspects of interaction within digital space
- Open up new directions in digital design through abstract synthetic space interaction

Students join the course in their sixth semester, after a series of both analogue and digital time based media (TBM) classes carried out in the first two years of their studies at the University of Thessaly. The course introduces issues fairly distant to students’ existing body of knowledge, keeping the whole experience within the digital domain. It should be stressed that the course is not dealing with methods of architectural design visualisation (new tools and/or techniques) but on the actual design of synthetic space per se differentiating it from other representation oriented attempts.

**Teaching Focus: virtual space and interaction as design process**

The main goal of the lectures featuring audio-visual and interactive material is to support students comprehend varied aspects related to the virtual domain and its design potential. Most students are familiar with few and disperse elements of Virtual Environments (VEs) through their involvement with computer games and recently through online social media interaction metaphors. However, although their experience with virtuality may be, at parts, rich, their overall understanding on the notion of interactivity is typically limited.

Grasping the aims of the course, how and where it fits within the architectural curriculum is becoming evident after the third lecture where certain exemplary cases are presented and discussed. Lectures are focused on stimulating discussion with the students and opening reflection over the concepts involved. However, studio tutoring which covers the significant part of the 13 week course is demanding. Discussing the concept and structure of each project should ideally be done as an open process with the participation of as many students as possible. In reality, one can rarely work with more than a dozen students around a large drawing board. Even so, discussion and argumentation around a computer screen can realistically involve only a handful of students, leading to team based tuition; a lengthy, time consuming process with no cross-exposure to ideas and solutions.

The digital tools students employ in order to complete their projects are 3DSMax [1] (for the production of VRML97 [2] files) and/or Blender3D [3] (for stand-alone interactive game projects). Both are three dimensional modeling packages; the former focused on professional 3D and animation work and the latter an open source and multi-focus package able to handle modeling, image processing, video post-production and most important featuring complex dynamics and interactions through integrated physics and game engines respectively. Learning curve relates to conceivable as well as attainable output - with blender3D challenging students and occasionally the tutor.

During the 2008-09 academic year, the author was assisted by a colleague and a postgraduate student, both very experienced and familiar with the technologies and tools used. Being able to have two or three parallel tutoring sessions helped immensely in both time spend per project, in depth analysis and overall quality of the final projects. The author is since trying to maintain the same level of support to all teams by effectively doubling tutoring sessions within a week to six hours.
Curriculum & attained goals
The quest for interactivity (Fox et al 2009) leads students to multisensory virtual narratives, seemingly remote to architectural education and training. However, experimenting and comprehending the relevance of Human Computer Interaction (HCI) and interactive design as well as addressing the lack of the “real life” limitations (plot, surroundings, orientation, size, access, vistas, etc.) and the inconvenience of designing in an empty void are important design issues to be addressed. Managing open ended design and identifying the implications of delivering digitally are of paramount importance in contemporary design frameworks. Finally the author argues that the
process of spatial design utilizing the triptych of sensors such as proximity, touch, plane, cylindrical, controllers in effect scripting language mediators and actuators such as motors, reactors etc. is already central to architectural design (energy conservation, smart homes, interactive art installations) and to contemporary digital media discourse (Bourdakis 2009).

It is interesting to note that by the end of their studies (two to three years after taking this course), a number of students acknowledge the scope of VEs and thus integrate VEs and interactive setups in their final year projects. Finally, the course is the stepping stone for another course taught by the author on designing interactions and further more elective courses in digital media offered at the Department.

STUDENT WORK CLASSIFICATION
The 150 works submitted over the last 10 years are organised in a database with title, short description (one-two paragraphs, typically in both Greek and English), interactive material, representative images and classification information (explained next). The whole database is online [4] and freely accessible to everyone as part of the course website [5], searchable based on classification, grade awarded and year submitted. Students are encouraged to explore previous works, experience and possibly get inspired from them. Figure 1 includes thumbnails from all works submitted up to 2010.

Project classification is loosely based and thoroughly modified to suit on a genre analysis for video games by Wolf (2005). VR works relate to games—both iconography and most importantly interactivity are issues analysed in the course—thus following a detailed examination of the student projects, the following genres are considered suitable and are assigned for classification:

Abstract, animation, chase, collecting, demo, educational, escape, explorative, fly, information visualization, maze, platform, puzzle, representative, simulation, sound/scape.

Table 1 lists the frequency of occurrence of each of the selected genres in the 150 student projects. The assignment of genres to projects is done by the author when the projects were added in the database; up to date the students were not asked to discuss or suggest suitable genres for their work. The majority of the projects are assigned more than one genre. Due to the complexity of the analysis and classification it was considered both pointless and misleading to have a primary genre assigned to each project.

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<thead>
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<th>Genre</th>
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<th>Genre</th>
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<tr>
<td>Abstract</td>
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<td>Fly</td>
<td>6</td>
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<tr>
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<td>7</td>
<td>information visualization</td>
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<td>Chase</td>
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<td>Maze</td>
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<td>Collecting</td>
<td>15</td>
<td>platform</td>
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<td>Demo</td>
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<td>Puzzle</td>
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<td>representative</td>
<td>25</td>
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<tr>
<td>Escape</td>
<td>18</td>
<td>simulation</td>
<td>77</td>
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<tr>
<td>Explorative</td>
<td>114</td>
<td>sound/scape</td>
<td>28</td>
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Bearing in mind the focus on interactivity, it is interesting to note that 114 works are classified among other genres as explorative, 77 as simulation and 24 as maze. These genres are generally the “easy way” through and out of the course; doing something familiar and close to past experience and hence not delving deep into interactivity.

The more relevant to the course aims genres are some of the 49 abstract as well as puzzle (14), educational (16), soundscapes (28) and information visualisation (8). These genres are assigned to almost half the number of genres mentioned above stressing the difficulties students face in developing a project scenario within the focus of the course.

PRELIMINARY OBSERVATIONS
Students’ past knowledge and experiences on TBM has to be challenged since the quest for interactivity encourages and often forces non-linear storytelling and exploration; issues rarely addressed in traditional TBM approaches. The development of
open-ended scenarios is proving a rather difficult task: students often try to construct scenarios based on a start–story develops–target is achieved–story ends basis. This typically derives from linear storytelling and not from computer games experiences. Indeed the notion of designing and constructing the virtual world as a game seems most of the time foreign, although a few teams take the challenge successfully every year. Once this hurdle is overcome, implementation is usually easier and it is a matter of experimenting and familiarising themselves with the available software tools and identifying a suitable methodology to follow.

The greatest challenge of the course is facilitating students’ transformation from mere recipients and plain users of a system to becoming the masters and controllers of design concept and process and, to an extent, programmers of interactive set-ups and VEs. Designing becomes an even deeper task, having to “invent” the framework and overall function of the project/application they are working on. Concepts deviate from typical project briefs and the tutor has an instrumental role in mediating and helping solve the problems that arise. Students often develop scenarios that are either too difficult to implement (they lack knowledge and experience to judge effort and time involved) or are too simplistic (over the fear that their “real” idea is impossible to design and implement).

The decision not to circulate a list of recommended projects topics/areas (that is often the norm in focused design areas) is loading the students with an average of 2-3 tutoring sessions. Still the author believes that due to the nature of the course it is important for students to investigate, gain experience and finally develop their own project through the necessary discourse. Despite the effort in helping and pushing the students through the interactivity threshold into designing re/inter-active 3D environments, still a slowly receding percentage of works submitted fall behind the aims of the course (as demonstrated from the genre distribution among projects).

**CONCLUDING REMARKS**

Addressing the problems identified and discussed in the previous sections, course material is being revised and “condensed” with more up-to-date examples helping students to pick up speed regarding the overall concept of the course. Furthermore in an attempt to get the students involved with their design concept before the theoretical part of the course is complete, last year it was attempted to split the theory in two parts, the basics plus examples of implementations (3 weeks) followed by a few weeks of discussion and working on the team projects, before the more technical parts are being taught in time to be implemented in the projects.

The roundtable approach in studio tutoring limits the audience to effectively single team tuition. Utilising an interactive display board could enable collaborative participation of a great number of students, enhancing the teaching process. Alternatively, or complimentary to this, the support by an extra experienced tutor specialising in VR and digital interactive media would be highly beneficial as 70 to 1 ratio is clearly problematic.

Half of the student projects demand no actual work (as in code writing or editing) by the tutor, with online lecture notes and resource pointers (wikis and even YouTube video tutorials) covering student needs. A quarter of the projects demand some coaching, code fragments communication and detailed explanations. The remaining ones (almost one in five) have the tutor greatly involved in the project development. These are often challenging well formulated projects, demanding solutions that are stretching clearly above students’ abilities (students have no prior programming experience) and often stretching tutors abilities as well. Since the course is not a technical/software teaching one, the tutor often has to actually write code (in java or python script language) adding vital functionality to certain projects. The author in these cases wants to ascertain that students have at minimum understood the methodology followed and the functionality of the scripts involved. Students may not be able
to replicate and write the code on themselves, but they are aware of how and what it performs. Hence ethical questions arising as to how far can/should the tutor get involved in helping and eventually implementing the code for the interactive features of such projects.

Reviewing the 150 projects and relating marks with assigned genres versus tutor involvement in the implementation stage, brings up most of the puzzle, educational and information visualisation works. On the other hand explorative and maze works as well as simulations of real life (mostly) events/phenomena are the easiest to construct, hence selected by teams that are not particularly interested in taking up the challenge and have the lowest demands on tutor coaching. Furthermore, these teams are usually the ones that are not following the lectures and thus face problems in understanding the concepts around the course and reach the set goals.

As far as the actual project outcomes are concerned, following a co-operation with colleagues in the School of Human Sciences, University of Thessaly, a selection of mainly educational oriented projects are being analysed and tested by undergraduate students as teaching tools in a classroom environment. For the following academic year there are plans for joined sessions with architects and educators in developing suitable design scenarios.

REFERENCES

[1] usa.autodesk.com/3ds-max