Representing ideas by animated digital models in architectural competitions

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ABSTRACT: This paper presents the results of the research and of related didactic activity, about digital representation in contemporary architectural competitions. 3D digital models, and more recently requested animations, represent a powerful tool for increasing evaluation capability by jury members as well as knowledge and comprehension by common people. The high complexity in creating and animating 3D digital models has to face an unusual separation of jobs and responsibilities between atelier activities and rendering works. The research constitutes one topic of a teaching, given in the 1st degree of Architecture Sciences (Polytechnic of Turin -Italy) and involves also continuous updating about software potentialities. Aim of the didactic activity is to provide the students some critical and operative tools in order to give them the whole mastery of synthetic representation of their design ideas. We can foresee, in future architectural competitions, the implementation of 4D representation, also referring to its progresses and applications to other media, like cinema and entertainment.

INTRODUCTION

> Who has had experience like a member of architectural competition jury panels composed by different experts, knows very well which confusion has done between the value of design and the fascination of representation considered as a painting… we will see in any year in which way video and virtual representation will act on communication in architectural competition. (Gregotti 1995)

In the last years digital representation has influenced the whole process of architectural design starting from the conception of ideas to the building drawing.
Some new tools of 3D modelling have approached the terms of *drawing* and *design*, leading them again to the etymological root, the Latin word *designo* (which meant both to draw and to design).
As Maldonado affirms, the syncretic nature of digital models offers new opportunities to scientific research and to architectural design. Tests and mistakes happen in a space in which our experience of problems is made fluent and immediate, for example in an architectural walkthrough. (Maldonado 2005)
The introduction of the dimension "time" into the traditionally static representation methods constituted a new powerful medium both in concept and in communication of design. As Lynn observes: "Contemporary animation and special-effects software are just now being introduced as tools for design rather than as devices for rendering, visualisation and imaging". (Lynn 1999:11)
As a new medium, architectural animation, is related to many disciplines, like Communication Sciences and Cinema Engineering and have to face to the traditional and consolidate peculiarities and techniques of film. This engages critical discussions on the ontological nature of films, on their narrative form, on their character of exploration of human emotions and involves the attention of architectural movies about perceptive aspects produced by the dialectic relationship between people and space.
Architectural competitions are one of the fields in which digital medium plays a central role as method and tool of communication. At the same time architectural competitions are both one of the most significant ways to obtain a professional charge and one of the most useful opportunities of didactic activity in teaching of Architecture.
The need of synthesizing and demonstrating the design ideas in a fixed and limited number of entry specifications is one of the peculiarities of communication in architectural competitions. These entries may consist in various iconic presentation media (besides written statements): boards, plastic models, 3D digital models, photographs, animations, films, digital presentations
All of them need digital tools (hardware and software) in their creation, manipulation, editing and blending.
3D digital modelling and animation represent a powerful tool for increasing evaluation capability by jury
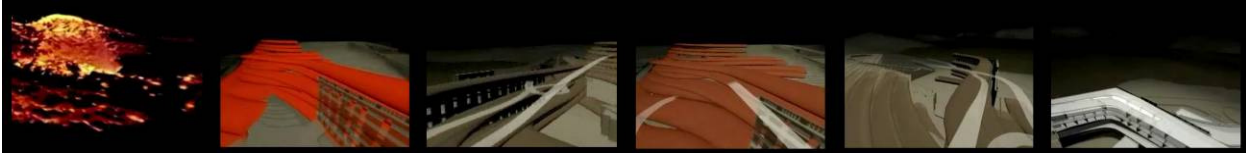
Figure 1: Hadid, Casino and Grand Hotel in Lugano, 1999 (http://it.youtube.com/watch?v=gGFxUetlzxM)

members as well as knowledge and comprehension by common people.

In this paper we present the results of our research and of related didactic activity, about digital representation in contemporary architectural ideas competitions. In particular we will develop some considerations about the elements of novelty introduced by animations in this kind of communication, with the purpose of expressing some proposals useful to the professionals involved in architectural competitions (architects competitors, organizers of competitions, jury panels) and of providing the students with some critical and operative tools in order to give them the whole mastery of synthetic graphic representation of their ideas.

1. DIGITAL MODELS IN ARCHITECTURAL COMPETITIONS: A RESEARCH ON ARCHITECTURAL PROFESSION

The high complexity in creating and animating three-dimensional digital models has to face an unusual separation of jobs and responsibilities between atelier activities and modelling / rendering / animating / compositing works. The relationship between atelier and rendering studios is accomplished in different ways: sometimes is made out of the atelier only the video compositing, some other the whole 3D work modelling. For this reason, sometimes, rendered images of 3D models and video haven't the same efficacy and don't transmit the same message of other graphic works processed inside the atelier.

Moreover specific creative languages and visual communication styles characterize the work of the main rendering studios overlapping to the architects' languages and styles.

We frequently observe the use of animation to convey a sense of space and poetry, obtained by a balance between realism and abstraction that creates a desire to be there, even when there doesn't exist yet. The buildings are definitely the primary subjects of the movies, but they're presented in a way that invites the imaginative participation of the viewer.

The task of video producers becomes not only to technically be able to understand the architects' design of the building, but to be able to imagine, using that knowledge, how the architectonic components of the building could animate and come together to form the building in its entirety in a way that stayed true to the architect's vision.

This chapter analyzes the meanings of digital representation in some of last ten years International Architectural ideas competitions, presented in chronological order. In particular we want to emphasize the potentiality of the new digital media to express and communicate architects' design thinking, also considering the technological developments of digital tools. In the development of this topic we take into consideration digital representations, in different kinds of architectural ideas competitions: landscape master plans, restoration and integration proposals, public new building designs…

Regarding the case studies below analyzed, has been collected some sources: the announcement (paying attention to the design requirements and to the requested submission entries), the subsequent acts of jury panels, the entries submitted by architects team related to their description of design thinking, the descriptions of competitions by architectural literature.

1.1. Case studies

Analyzing some architectural videos produced in the 90's, we noted that most of the works are characterized by a sort of standard movement with a fixed path of the virtual camera: using a simple walkthrough 3D they explored an empty architecture, very similar to "the scene of a crime" (quoting the words of Walter Benjamin to comment photographs of the streets without people of Eugene Atget).

Probably Zaha Hadid was one of the first architects that used digital tools as a method both for concept design and for representation. Themes of project like dynamism, fluidity, transparency, find in digital modelling a solution as regards to design and to representation (Schumacher 2004).

Besides 3D animations offer an opportunity to go beyond the two-dimensional quality of drawing and painting and move around the new, computer-generated world in buildings that are still at the design stage. Since the end of '90 she applied 3D animation to explain the process growth of her concept, like in the

Figure 2: Herzog & de Meuron, Munich football stadium, 2001 (http://it.youtube.com/watch?v=Akoz-mE1ANk)

Figure 3: Carbonara, Villa Reale in Monza and its Gardens, 2004 (http://www.studiodim.it/animazioni03.htm)

competition entry for the *Casino and Grand Hotel in Lugano* (Fig. 1). In the short video (0:58), realized in 1999 by Neutral, a magma flow freezes into an architectural extension of a natural topography, to envelop the existing buildings. The model is rendered in conceptual way: only by colours, red and white, that represent lava and ice. This kind of representation is fully in tune with drawing and painting style of Hadid.

Two years later Herzog & de Meuron won the design competition for the *new Munich football stadium* (Fig. 2). In the project the elegant 2D surfaces of their first works develop in a three-dimensional oval building, which polymeric façade can be illuminated in the colours of whichever home team is playing. The enclosure design evolved from a basket-like arrangement of woven ribbon elements to diamond-shaped pillows patterned in similar fashion to the Bavarian flag (Guardigli 2006). On arrival spectators encounter another unique architectural feature of the building, the geometrically extremely complex "cascade" of stairs that wrap around the perimeter of the building, just visible behind its glowing, translucent skin. Digital modelling demonstrates its efficacy to communicate these ideas, for its capability to represent the shape and to render materials and lightings. In particular the short video (1:35), by Neutral, shows the channelling of thousands of spectators which determines the geometry of the landscape leading to the football stadium and simulates the sport activities inside. Motion effects result from the blending of digital model with realistic film (car traffic, football teams' fan, mass of clouds) and from the simulation of colours and lightings changing.

In 2004 there was an announced International Design Competition for the *Refurbishment and Enhancement of the Villa Reale in Monza and its Gardens* (Fig. 3).

The survey of the whole complex has been prepared for generating materials to support the restoration. A 3D model of the whole Villa "has been realized to guarantee an almost complete accessibility for the

winners of the competition. The advantage of this simple modelling resides in the potentiality that this integrated raster vector model gives in the projectual support, in the contextualization of new interventions, in their simulation and in the highlighting of the future

distinctive hierarchies" (Achille, C. 2005:5). Very probably this model constituted also the basis for the digital movies expressly requested in the announcement. Carbonara, the winner of the competition, develops his idea in creating relationships between existing and new buildings, between the old villa with its gardens and the urban setting. The video (4:15), by StudioDIM, mixes various media and materials (in part presented also in the competition boards): satellite views, 2D drawings (site plan, horizontal and vertical section) static-photomontage and frames of film. It shows the different kinds and scales of intervention: from the territorial design, to the conservative and integrative restoration of buildings, to the requalification of gardens (Montini 2007).

In the same year, the architectural proposal by Hadid, awarded with the first prize, for a city's *new concert hall in Basel* (Fig. 4) has been represented also by digital models and animations. The digital models get off the conceptual abstractness that characterizes the works of Hadid. The video (4:19), again by Neutral, investigates the buildings integration into the architectural and cultural fabric of Basel, shows in which way the different levels of the square may become a continuous landscape and explain the idea of the new building, articulated by bulging the surface and by hollowing out the volume (Zaha Hadid 2006). New building and existing setting change from conceptual to quite photo realistically renders; in particular architectural context is simply modelled and textured with photographs of the façades. The video is very dynamic for changes of camera speed and of projection (zenithal, human-eye, bird-eye), by secondary animations (people, cars), by voices, sounds and music.

Gardens by the Bay International Masterplan Design Competition (Fig. 5) was launched at the beginning of 2006 with the request to create three distinctive waterfront gardens defining Singapore as the world's premier tropical garden city. Grant Associates, the winner team, specified that "The Gardens must have a physical, sensory and spatial expression that is unlike anything seen or yet imagined in the world… must be based on a total examination and expression of the future relationship between people and plants, culture and the natural world… the Gardens… should be an exemplar of integrated open space planning and
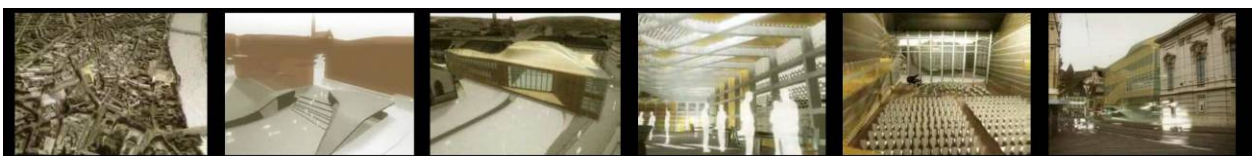

Figure 4: Hadid, Concert hall in Basel, 2004 (http://www.youtube.com/watch?v=v64vJkprMRs)

Figure 5: Grant Associates, Gardens by the Bay, Singapore, 2006 (http://www.squintopera.com/#/projects/?id=26)

management linking horticulture with living, recreation,science, art and culture, digital information and media, retail and commerce, food, leisure and education" (Grant Associates 2006:1). The two movies, by Squint/Opera, propose a fantastic reconstruction of the architect's process to build the structures a team of architects imagined. Imaginatively rich, the videos elucidate the scheme's ideas and inspirations. Animated sketches, paintings and doodles become, and sometimes inhabit, highly detailed three-dimensional animations, while views in plan and section are subverted in a humorously unscientific fashion. This approach, that distinguishes the production of the studio, fully expresses the architects team research of a emotional and sensorial experience obtained by combinations of nature and architecture. About this competition entry, the judges said: "The design concept… captures the essence of a Garden in a downtown setting, the experience of colour and vibrancy across 24 hours in a day, 7 days a week, all year round. This was achieved by the strategic location of display gardens and activity spaces, with careful consideration given to day and night programming" (Announcement 2006:1).

At the end of 2006 the "Philharmonie de Paris" announced an International Competition for the building of a *new large concert hall in La Villette* (Fig. 6), principally dedicated to symphonic orchestras. Located in an outlying zone, into a cultural park, the Philharmonie has to be an innovative architecture, equipped with an exemplary acoustics. The concept of enveloping hall has been considered useful to create a sort of intimacy between musicians and audience. (Concours Philharmonies 2007). We can compare the short videos, about 1:30, submitted by three of the six second stage competitors. In the short time at their disposal two of videos (Nouvel and Portzamparc) focus on the inside shape, while all count of the emotional effect of music which outlines the function of building. About his project Nouvel, the winner of this competition, "said that the novelty of his auditorium was to suspend balconies, they will be attached to the building by access passages, in a way that allows sound waves to circulate around and behind them. The idea is that the audience will be in the middle of the music" (Building a

Paris Hall 2007:1). The video of Nouvel, by Artefactory and Odile Fillon, starts from the outside, but the first part is unclear. The written comments help to understand in a few seconds the structure; the idea of showing the digital model as a plastic model, in which are then applied various staging is original and effective. Many sections provide a significant help to understanding of the project.
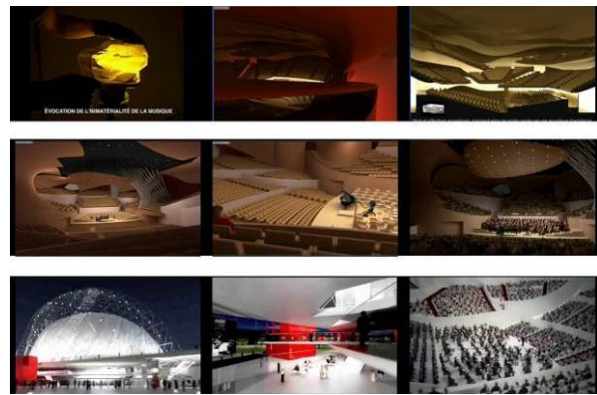

Figure 6: Nouvel, Portzamparc, Soler, Philharmonie de Paris, 2006 (http://www.lemoniteur.fr/video/)

The video of Portzamparc, produced by his atelier and Chuba 4 and composed by Bartproject, only shows the interior of the Philharmonie, with a camera movement characterized by a progressive approach to the stage. The animation is not continuous but fades continuously; doing that, it's possible to present many points of view (from the audience, the stage, the gallery) in a short time. As increasing the intensity of the music, the scene is completed by spectators, the orchestra, and a more exhaustive lighting system. The video of Soler, divided into three parts, begins with the approach to the project, exploring the urban context; the second part shows the foyer, while the third moves inside the hall. The hall looks crowded with people: there is a secondary animation, limited to the orchestra. The hall is completely white, a solution that doesn't allows to appreciate in depth the geometry that characterizes the project. The end of the movie is focused on the context

Figure 7: 3xn, Headquarters building, Berlin, 2008 (http://www.cadpeople.com/galleri_berlin.asp?valgt=Berlin)

again, using a top view in a gradual moving away.The Design International Competition for a *new headquarters building for the German rail group* Deutsche Bahn at Washingtonplatz in Berlin (2008), won by 3xn with the "Cube", awarded a project that combines the even-sided geometrical shape with diagonal arrays on the façades (Fig. 7). The basic structure of the Cube is a cross shape with four main cores. The cross is formed from fan-shaped floors rotated around the building's axis, creating a natural movement that pulls up through the building like a spiral. The proposal represents, regarding to its dimensions and its massive shape, a building with a strong design that offers a strong message and a clearly designed landmark. 3xn are deeply involved in digital revolution. As they affirm, they "work with terms like scripting, animated, parametric and algorithmic design… With the advance of computers, our working procedures have changed radically. Today, we draw buildings which in the past would have been categorised as pure science fiction" (3xn 2008). In particular they are interested in "Design with time as a fourth dimension. It often involves software which is primarily used by the film and gaming industry. In animated design, volumes can be changed into dynamic objects / soft bodies, and be impacted by different force fields, which makes the design vivid and dynamic" (3xn 2008). 3D images and video (3:41) for the above mentioned competition entry, produced by Cadpeople, demonstrate close collaboration of

producers with 3xn, understanding the ideas and following the graphic style. The video shows an original communication and visual approach. Using the shape of the cube like a "curtain" between different topics, it starts giving evidence to the context, the concept process, the accessibility. Then, in illustrating the project, uses particular camera motions alternating accelerations and stop image and singular representation's techniques changing from conceptual visual style (in greyscale with some spots of primary colours) to soft rendered images.

2. DIGITAL MODELS IN ARCHITECTURAL COMPETITIONS: A DIDACTIC PROPOSAL

The research themes above presented constitute one theoretical topic of a teaching, entitled *Digital representation techniques for survey and design*, given by professor R. Spallone, assistant professors M. Lo Turco and M. Sanna, in the University 1st degree of Architecture Sciences (Polytechnic of Turin - Italy).
During the practical part of the course, students learn how to create 3D models, render, static photomontage and short animations, using principally the last release of AutoCAD, 3D Studio Max, Photoshop and paying attention to some useful plug-ins and open source software. Every year, about one hundred students, coming from 2nd and 3rd year of study in Science of Architecture, constitute the class. They have only basic skills about digital representation tools, in particular in
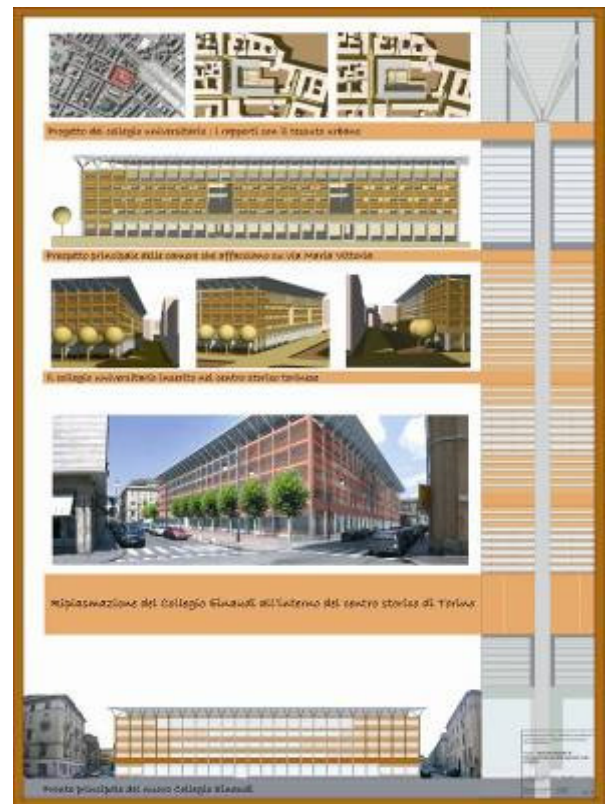

Figure 8: Architectural competition boards by students Boccuzzi and Del Boca

1st year they learned to use AutoCAD for representing, by 2D drawings and simple 3D models, the design developed in the 1st year Lab of Architecture - Town Planning. Therefore, aim of the didactic activity is to provide the future architects some critical and operative tools, achieved by the knowledge of techniques, methods, and processes of digital media, in order to form, read, and communicate design ideas.

For the final exam they have to realize two boards and an animated presentation in which they show one of their architectural designs, according to guidelines simulating a professional architectural competition, as below described. The works are evaluated on the basis of their efficacy and synthesis in the communication of design intentions.

The two boards requested, in A1 format, have to tell the design, above all, through images, highlighting the strengths and using different representations and techniques: from modelling urban context very simplified, to solar studies, from exploded axonometries, to thematic plans and sketches for describing the evolution of the idea, using design codes consistent with the theoretical contributions analyzed during the course. Even the design layout proposed by students follows the same rules, creating an additional feature to capture the attention of the viewers (now the teacher, in the future it could be the jury awarding) guiding them in understanding the peculiarities of the design proposed.

In the first couple of showed boards (Fig. 8), the layout is constituted by a very regular grid, recalling the scan, of regular prospects designed and the existing urban context. The first board is characterized by a general supervision, providing still a very simplified 3D model. The central part is devoted to a well done static photomontage, (excepting for cutting the top of the building and the absence of shadows of some parts belonging to photography, imperfections correctable in post-production). The second one deeply analyzes the project, viewing the internal college, highlighting the design themes: the solution of the angle of the building, the insertion in the urban setting, the analysis of a module of façades for the disposition of the openings. Even the layout colours are congruent with the design choice, in order to further standardize the message suggested.

The second pair of boards (Fig. 9) are related to a project inserted into a completely different environment: the relationship with the green, paths and the context of a country play a key role, as the design of the whole layout, both for the chromatic level and for the provision of various parts, forming an almost organic composition, which contrasts with the more rigid organization of the pair of boards earlier described. Also in this case the first board allows a wide urban environment analysis, in which the plans show different scale readings issues extremely effective. The model that combines digital and conceptual sketch has a great effect, seeming to emphasize that the process is a complicated phase that involves the use of many
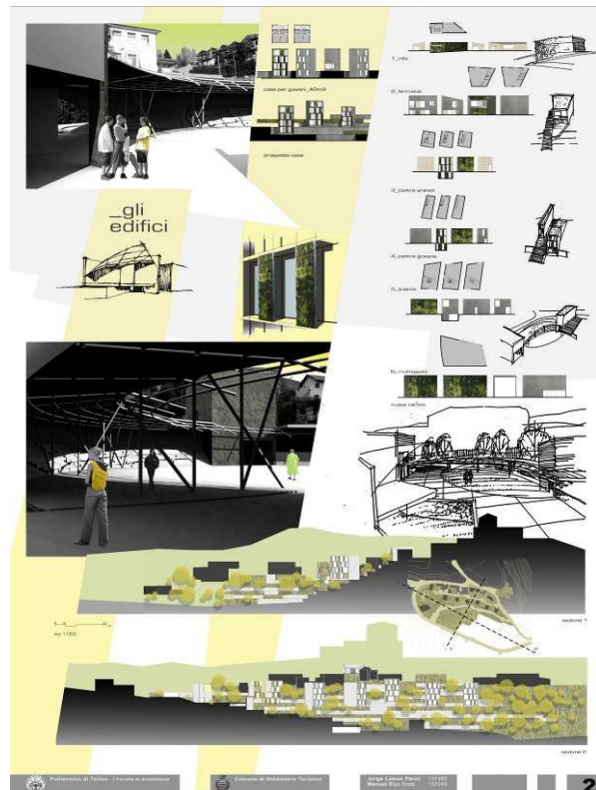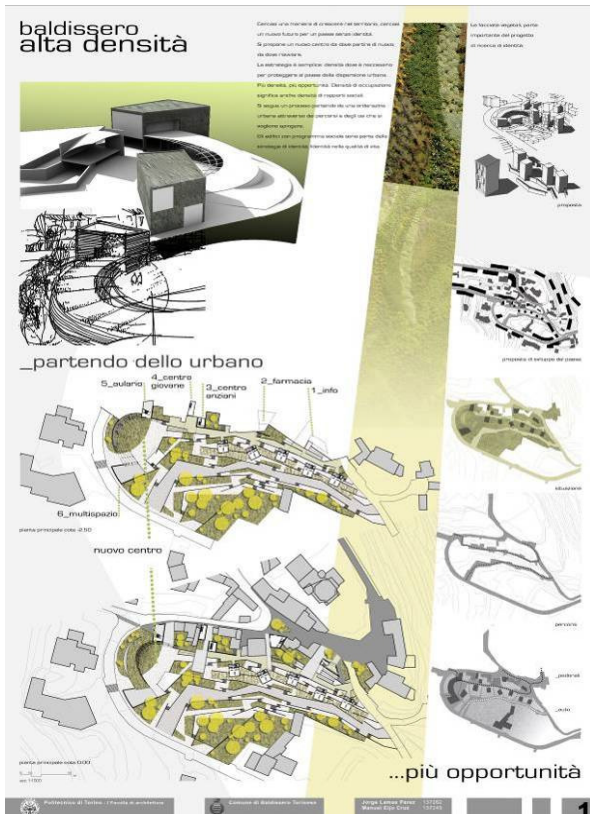

Figure 9: Architectural competition boards by students Lamas Pérez and Eijo Cruz

different techniques and knowledge. In the second board the attention is focused on buildings, classified by types, and displayed using a large scale through landscape sections. The design also involved a detailed study of common spaces, represented with perspective views in shaded and wireframe visualizations.

Many students are very enthusiastic about the world of three-dimensional modelling, as the basis for short animations production under the guidance of the teachers. For approaching to the professional works analyzed during the course, still supplementary contributions would be necessary, with some lessons related to different disciplines, (treating the movements of the camera, the transfer of different sequences, overlaps, nuances, and so on). Only in this way we could ensure a critical control of the whole ideative / creative process of a movie characterized by multiple effects added in post-production.

3. NEW TRENDS IN DIGITAL MOVIES: SUGGESTIONS FOR APPLYING IN ARCHITECTURAL COMPETITION

Computer aided design today encompasses also technologies incorporating animation, interactivity and immersiveness. Some of them, starting from interactivity, could be useful in architectural competition to allow to the juries free explorations of the project.

Different levels of interactivity, *linear progression* (the users get to understand the design by following a pre-set pathway) and *non-linear progressions* (the users freely decide where they will walk, and how they will interact with the objects) could be at juries' disposal.

Technologies coming to the world of entertainment, especially for videogames engines, allow to use a scenario developed with traditional 3D modelling software, with a high level of interactivity giving us the chance to explore a virtual environment randomly in real-life time. In addition to the gaming world, some film productions in recent years use special effects and spectacular shots with the technique of camera-tracking. Combining live-action footage and computer-generated elements becomes more common; match moving has taken on an increasingly valuable role in visual effects.

The camera tracking technology applied to the field of architectural representation is used in the creation of movies, in which the project is dynamically embedded within the existing framework, to constitute a kind of dynamic photomontage.

The competition movie, by Stack!Studios, for the *rehabilitation of the Palavela* (Fig. 10), designed by Aulenti, for 2006 Winter Olympics of Turin, makes a large use of this technology: a shoot taken from an

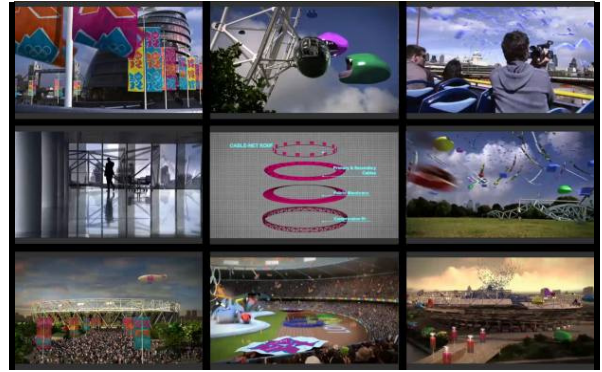

Figure 10: Aulenti, Palavela, Turin, 2005

Figure 11: HOK Stadium, London, 2007
(http://www.squintopera.com/#/projects/?id=25)

helicopter is useful for appreciating the complete work using live-footage of the park Italia '61 and the city entrance.

Among the works of international video producers, new trends seem to emerge by those of Squint/Opera, studio in which the close collaboration among architects, designers, visual effect artists, writers and music composers produces a multidisciplinary approach to making short films about architectural designs, combining innovative visual effects and illustrative techniques with imaginative design, as below illustrated analyzing two their movies.

Abu Dhabi's Urban Planning video is very useful in analysing the four key features of the plan for the city's future (transport, green, habitation and sustainability), making use of huge letters from invisible strings hand in a city's streets, presented in the form of spots, to which follows the exploration of photorealistic digital model. Abu Dhabi's video is realised in detailed renderings that combine live action with an animated cityscape in stylised plan and cross-section; original tracking shots and sudden shifts in scale elegantly reveal different components of the master plan.

The video presenting *the design of the HOK Stadium* for the 2012 Olympics in London (Fig. 11), combining live footage with detailed animation, gives a sense of the project's scale by putting its components in impossible location; at the same time it communicates a surprising quantity of factual information on the structures. The kind of the movie, unlike others, is deliberately popular and instrumental in defining the Olympics in the public imagination. The motion tracking gives a more realistic animation of human movements (human motion tracking) and the inclusion of the project into the urban context (compositing video sequence filmed with a moving camera and computer-generated images).

Both of the videos reveal the nature of the studio, expert in film and media production operating within the film industry and architectural practice.

Other innovative techniques (real-time systems, augmented reality), still absent in architectural competition, could become future fields of research in communicating architecture.

4. BETWEEN ACADEMIA AND PROFESSION: FUTURE FIELDS OF RESEARCH

The search for new languages involves the employment of new technical experts to support the architects. Recently, this synergy between different fields is pointed out in architectural animation productions, rising up new communicative issues. As we described before it's easy to figure that advanced techniques now devoted to other areas may also soon modify the field of architectural competitions.

"Scholars of architectural design began to see computer-based media not just as "tools", but increasingly as the Method… After an extensive period of fine-tuning existing conventions, it is time for inventions. What is needed is a wholly new conception of the physical interface, which can stimulate the imagination and concretisation of new realities" (Breen 2008:138). Some themes we consider worthy of expansion in the near future, especially in architectural competitions, such as entertainment media (learning from game formats and theories), interactive interfaces and new 3D visions (new spatial experiencing). "Considering architecture as an art form, we might learn from other artistic disciplines (transmitting this knowledge to the students), such as *moviemaking* (cinematographic approaches, sequencing and animation), *theatre* (physical expression, interaction, improvisation) and *music* (rhythm, harmonic variation, but also digital recording and sampling). These may expand the *palette* of architecture (traditionally making use of drawings, models, pictures and symbols)" (Breen 2008:140). It's crucial to consider the contemporary game culture as a "serious medium": the interactivity and elegance of particular digital game applications are giving new incentives to the practice and education of architecture.

Moreover, a new development, which might be of considerable interest for the "digital architecture" community is 3D cinema. As formats such as 3-D IMAX and REAL D come into view, experts and students should get seriously involved. Although these techniques are initially target a broader "cinema" audience, one might foresee perspectives for architectural representations, developed by more specialised groups and potentially even becoming tools for the design studio and of the future.

We feel the need to involve into Academia some professional disciplines which focus on visual communication and digital presentation, useful to transfer their language to the students.

Another aspects is the need to renew, year by year, the contents of the course, "moving with times", both from the technical point of view (software used and open-source alternatives), and from the cultural one, transmitting to the students this importance of modernization.

CONCLUSION

It is easy to figure that in future such acquaintances will find a correct application also in the architectural competitions, whose demanded are renewing of equal step with the technological development.

What now represents the vanguard of the computer graphic, it could become an essential requirement for the participation to a competition: the production of navigable dynamic models (real-time), the realization of video interactive in augmented reality melting 3D model with some footages of the existing urban context, the real-time stereoscopic models.

We could hypothesize some possible scenarios for future architectural competitions, when the modelling phase and simple animation will not represent that the first step of the representative path.

Added materials given to the participants:
- 3D city context of the intervention area (buildings and terrain 3D) taken from some freeware applications such as Google Earth. 3D models online are increasing and soon they will cover at least the greater city centers;
- video footages of the existing area, in order to merge with them the project.

Requested materials:
- going through model in real-time on line;
- interactive model with the possibility to change some design variables, such as light systems (the natural and artificial ones), free standing equipments…;
- animation of constructive phases, in order to better understand the relevant design;
- animation with stereoscopic sight.

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