

# Interplay of Domains

## *New Dimensions of Form Generations*

SCHNABEL Marc Aurel

*Department of Architecture, The University of Hong Kong, Pokfulam, Hong Kong*

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**Abstract:** A diversified, open-ended, and critical approach of architectural design that interplays with a variety of media, suggests an innovative development to gain new spatial solutions. Architects and designers are aware of these possibilities by integrating physical and digital media during their design process, yet the creative potentials of these media are rarely used to their full potentials. The architectural design process can be enriched by using uncommon perceptions, comprehensions, and conceptions of spatial design translations within both physical and virtual environments. A wilful interplay with the design media and the process offers the possibility to dismantle the limits of each domain and explore the design itself in unorthodox ways. The overall engagement within both real and virtual environments leads to innovative form creations and powerful design solutions. Following the tradition of artists, who explore media in unusual ways, new architectural interpretations emerge, reflecting on the media as well as the architectural design.

## 1 INTRODUCTION

In the course of a design process, architects use both physical and digital media, tools that aid them in creating and exploring their designs. In the development of Frank Gehry's Guggenheim Museum, for example, the architect used physical models that were translated into digital form, which then resulted in the building itself (Osman 2001). With the re-representation from a real to a virtual three-dimensional (3D) model or vice versa, shape and design are translated so that they fit into the new medium's characteristics. Yet the quality of design and the depth of its form-finding are directly linked to its media of representation, communication, and collaboration (Kvan 2002). These re-representations allow new opportunities to arise, and the reconnection of the various design phases permits a finer understanding of the overall development. Consequently, if such qualities and possibilities influence the re-interpretations that generate the design process, then the interplay of media amplifies the designer's opportunities (Herbert 1995).

The purpose of this paper is to explore some possibilities for generating new architectural expressions by wilfully interplaying with a variety of tools that allow a translation between reality and Virtual Environments (VE). This allows a reflection

on an architectural design process that uses innovative methods of form-generation and -representation, as well as on its educational implication. To this end, the paper will first introduce samples of artists and architects, who intentionally use nonconforming techniques of translation and representation in order to define and create unique architectural expressions: *objets architecturaux*. In the next section, the paper will reflect on these methods within the context of architectural education. Finally, it will discuss implications these new understandings and communications of architectural gestalt and design processes generate.

Design is a greatly complex activity, one that is influenced by numerous factors. The process can follow rules or established proceedings and traditions. Alternatively, the designer can choose to explore freely without adhering to conventions. In all instances the medium in which the exploration takes place surely affects, to some degree, the act of designing (Ataman 2000). To use these influences, artists and designers regularly cross over into different media, domains, or techniques. By pushing media to new definitions, they re-interpret in an innovative way both the media themselves and, with that, their artwork (Daru, Vreedenburgh, and Scha 2000). Clearly, this method is not new and has already been practiced for a long time. In today's context, however, the recent innovations in digital technologies have created new opportunities that imply changes in the way we create and approach architectural design (Jabi 2004). An architectural design process can contribute to this development by allowing an innovative intersection of domains, media, and expression in the way physical and digital modelling, fabrication, and translation technologies are used.

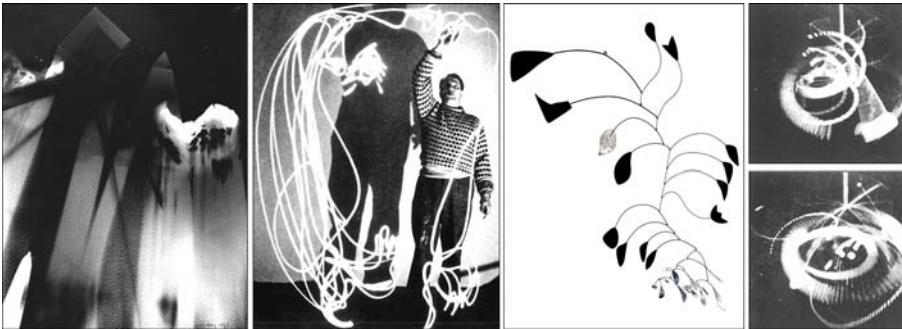
## 2 TRANSLATIONS

In order to place this paper in a context, we begin with some examples in which artists explored media in an inventive way. Hereby, they investigated and experimented with the potentials of various media, potentials for which those media were not initially designed. By doing so, the artists created new interpretations and understanding of the media and their artwork: *objets d'art*. The artist Man Ray expressed and communicated ideas in photograms he called *Rayographs* (Figure 1 left). In these, Ray "drew" directly on photographic paper using light sources and objects. He intentionally altered the "normal" way of photographic reproduction and omitted the use of a camera. The objects, movements, and lights became the tools that created the artwork on another medium: photographic paper.

Similarly, the architect Jørg Utzon and the artist Asger Jorn regularly used a variety of physical and virtual media to convey spatial compositions. Asger Jorn represented sketches by Utzon within a 3D space. He used a torchlight to generate a virtual 3D sketch (Figure 1 centre-left), emulating Picasso's style of sketching. Similarly to Ray's technique, the translation of light and its movements into a new medium created a unique transformation and understanding.

Likewise, Herbert Matter re-interpreted artworks using media or tools out of the conventional context. Based on the *Mobiles* by Alexander Calder (Figure 1 centre-

right), he produced a short film in which he unconventionally used cinematic techniques. He translated and merged sound elements by John Cage's with movements of Calder's *Mobiles*. Matter translated light, movement, and sound into new dimensions that created an innovative cinematic experience and whereby he pioneered cinematography into a new dimension (Figure 1 right).



**Figure 1** From left: *Rayograph* by M. Ray; A. Jorn using a torchlight to sketch; A. Calder's *Mobile*; Stills from H. Matter's movie

These examples demonstrate that, in order to achieve new interpretations of *objets d'art*, the artist had to cross over diverse media and domains. In their creative acts, the artists did deliberately not seek a direct facsimile translation of their creations from one medium to the next, but an unpredictable adventure of creation. They explored the possibilities these re-interpretations offered them to develop their artwork into a wilful different interpretation. This deliberate act to step outside of conventions opened up new ways to translate physical into virtual objects. Thus, the artists generated and communicated their ideas and creations through their re-interpretations.

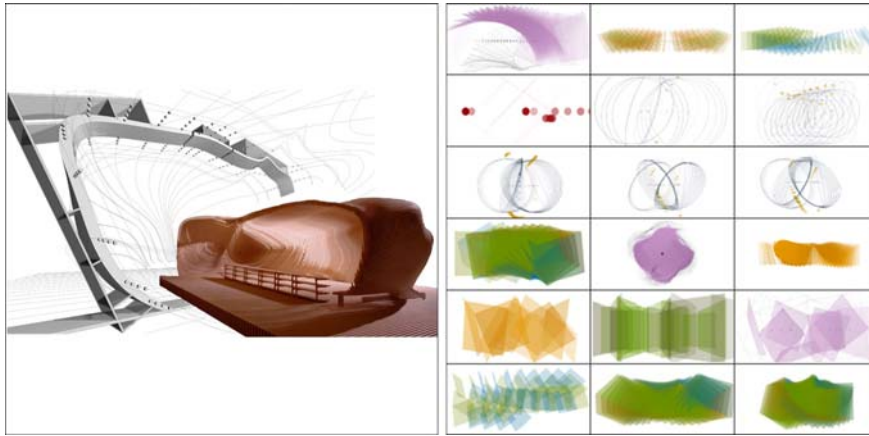
### 3 INTERPLAYING DOMAINS

Correspondingly to the interplay of media by artists, the creation of architectural design is not limited to a definite and predefined method: Design, gestalt, and function can be appreciated and perceived through a variety of processes that lead to an understandable and creative design (Arnheim 1969). For this reason, the very different properties of physical and virtual design media allow architects to create *objets architecturaux* that make use, during their development, of the particular properties of each design environment. Translating the concepts from those examples, as illustrated above, innovative form generation for architectural design can be achieved by re-interpreting outcomes from one domain into the next in a non-facsimile approach.

*dECOi Architects*, for instance, set off for their design of the *Miran Gallery* with the existing void of a Parisian fashion showroom. They translated existing surfaces of

walls, ceiling, and floor into a wrapped surface that reflected the quality of textile fabrics (Figure 2 left). In a next deliberate act, they combined a *tone-curve* description of image-processing software with parametric modelling tools to transform these surface-patterns into 3D shapes and volumes. The tone-curve is used to describe and modify brightness conditions of a pixel-image. The architects hereby wilfully crossed over functions from one software to another. In order to achieve a homogeneous gestalt of patterns and rhythms of their *objet architecturaux* within the space, the architects distorted the form using paramorphical descriptions of its geometry. These unorthodox descriptions of the volume were then translated, adjusted and manipulated with the help of physical models. Only through the deliberate exchange of physical and digital models and vice versa, the architects and the client could study the impact the design has on the existing space within various aspects concurrently. In their design development, the architects treated the virtual and real components not separately but as a whole. This method was repeated and altered until the architects were satisfied that their design met functional and building requirements as well as creative desires. This intentional interplay of realms resulted in a design that does not purely fit its function, as, for example, in Alvar Aalto's *Paimio Sanatorium*, or its gestalt, as in Gehry's design mentioned earlier and follows the artists' heritage as illustrated above.

Respectively to the design methodologies of architects that use a variety of media to create new *objets architecturaux* of spatial design, John Maeda (2004) abstractly re-interpreted Alexander Calder's *Mobiles* by playing with various possibilities of design interpretations. Comparable to Herbert Matter's deliberate crossing over of media, Maeda converted the physical elements of a mobile into new digital representations of shapes, which were generated by a parametric design system called *ParameterVision* (Figure 2 right). Hereby, the system constructs every possible image and shape configuration that can be viewed in a single two-dimensional (2D) image plane. Motion and time are augmented through digital transformations, allowing the viewer to experience wilfully the relationships among movement, time, space, and colour by modifying the digital parameters. Thus, the virtual mobile can be viewed on the screen two-dimensionally and at the same time be perceived and experienced spatially as 3D volumes and spaces within a VE. This interpretation that is not done by the *ParameterVision* itself but through a wilful act by the viewer creates architectural spaces that neither the mobile nor the system makes perceivable by itself. This relates to the Rayographs, which are 2D depictions. Yet the viewer can experience them as 3D spatial compositions.



**Figure 2 Left: dECOi's Miran Gallery; Right: J. Maeda's Parametervision**

These two examples illustrate that an open-ended and diversified approach to creating architectural design and spatial expressions leads to a new exploration of a design and an understanding of a complex spatial solution. The value of this method in the context of explorations of gestalt within real and VE has already been reported in Schnabel (2003). The understanding of spatial issues is enhanced and evokes innovative architectural results. Singular representation within one media has inherited constrains. By applying wilfully an orthodox method in handling a variety of media, designers express and communicate their ideas within the different properties of the physical and virtual domain concurrently. The transformation from one domain to the other or the intentional crossing over of media initiates a new understanding. This reduces the gap between idea and creation and consequently the designers are empowered in their act of expression, exploration, and translations.

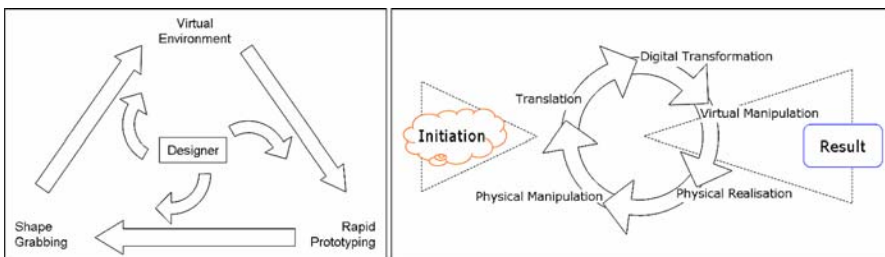
#### **4 RE-INTERPRETATIONS**

Simultaneously to the endeavours of explorations of media and realms within the professional setting, architectural design studios offer a platform to investigate new approaches to design developments and to expand architectural education. In this context Dave (2003) argues, instead of focusing on digital tools and information in isolation there is a need to conceptualize and experiment with hybrid work environments. The introduction of automated manufacturing processes, the opportunity of directly translating virtual creations into physical artefacts, or vice versa generated new techniques of instructions in order to intersect digitally conceived, structurally clarified, and directly manufactured studio designs that are communicated between teacher and students (Abdelhameed 2004). These hybrid processes are used as didactic vehicles to introduce new approaches of form generation and design-communication. So far, however, there has been not much reflection or investigation of the effects and the implications this may have on the tradition of architectural education.

There is a growing trend of architectural schools all over the world engaging students in exercises of repetitive interactions and re-interpretations from real to virtual and back to real, some of which have been reported, for instance, by Petric and Maver (2003), Daubmann (2004), and Schnabel et al. (2004). The spectrum of the new design studio exercises reaches from facsimile re-representations to creative exploration of form, function, and structure. In these above-mentioned studios, the boundaries between physical and VE are taken apart to the extent that they either merge into each other or become clear entities within their own assets. Yet they have fundamentally different objectives and pursue different learning outcomes.

Petric and Maver (2003), for example, suggest that the designers are at the centre of the process. They are surrounded by a variety of media, which they apply in their pre-described way (Figure 3 left). Each representation of the design is reproduced as a facsimile within the next media; it becomes an *objet copié*. The different media act not as exploration tools to further develop the design and the process of form generation but as devices of direct re-representation. This rigid approach is similar to Frank Gehry's working method (Osman 2001) and differs therefore from the wilful exploration and the unpredictable adventure of creation of the design development as discussed earlier. The design is only translated into the next media in order to prepare it to a manufacturing process. Any change of design requires a restart of the overall procedure.

A very different approach is presented by Schnabel et al. (2004). Students engaged themselves in a "design-cycle" (Figure 3 right), in which the design and its process lie at the centre of the development. Hereby, each translation from one medium to the next develops the design further into a completely new entity. Each step is not pre-described, can be exchanged, or omitted if desired. Students explored the opportunities that the transformation from one domain to another offers. Correspondingly, to Asger Jorn's and Jørg Utzon approach, the designer investigates and translates the *objets d'art* within each medium according to its own strengths. The different possibilities and aspects of the design become unique in each phase; thus, the process of re-interpretation itself becomes a creative act, and with that, the designs become *objets créateurs*.



**Figure 3** Left: *Objet copié*: the designer is surrounded by the tools; Right: *Objet créateurs*: the design is developed by a variety of media

Until now the rapid development of media, their availability, and their possibilities are by far greater than they can already be explored to their full potentials and implemented into educational frameworks. According to Asanowicz (1996) studio teaching often adheres to traditional ways of exploration rather than exploring the possibilities beyond their pre-described operation procedures. In this context students often pioneer and move ahead faster than the educational system reacts to new phenomena. To advance further, the design studio offers students and teachers a platform to engage creatively outside the given possibilities that a medium, a different technique, and a pre-described interplay of media suggest.

## 5 DISCUSSION

Since VE can be an environment for design to be distinguishable and to facilitate reality, the presented examples discussed here used and needed both domains to achieve an overall conclusive design from the idea to the final architectural presentation. A significant feature of these design methods is the deliberate focus on multiple rather than single interactions. The unorthodox combination of digital and analogue media introduces new aspects to the design. These aspects challenge designers with unique objects that arise from the unconventional context in which media and tools have been employed (Schnabel et al. 2004). In the described cases, the non-linear design processes and the connection of ideas with a variety of transformations led to new design paradigms. The hybrid work environments enabled the architects to engage outside a singular and pre-described design setting (Dave 2003).

In cases like the dECOi's Miran Gallery, the boundaries between the physical and the virtual have been wilfully dismantled, and these environments are not treated separately as individual entities. Only by doing so, the interplay of both domains allows a different approach and definition toward design creation, exploration, and communication. Hence, this enables a holistic dialogue about design, form, function, and architectonics that is significant not only to architectural profession but also to all other dialogues involving spatial representations. In virtue of the artist heritage design follows its own paradigms, thus evolving and re-establishing itself by its own developed expression (Daru, Vreedenburg, and Scha 2000).

Exchanging 3D media and settings of physical and virtual environments proves to be a successful method for conveying and creating architectural design. This applies in particular to the architectural education with its design studios (Kvan 2002). The students can create, comprehend, and communicate complex spatial designs by manipulating them directly within the 3D space. The translations from physical to digital or vice versa offer them new options to engage deliberately not just in pure mechanical but also in creative acts. Comparable to John Maeda's *ParameterVision*, a design process can spring off from *objets trouvés* and develop further to *objets digitalisés* until they result in *objets architecturaux*. Schnabel et al. (2004) demonstrated how the outcomes that started from a series of translations from both environments generate understandable and rich spatial expressions. They illustrated

how physical and virtual representations contribute to the overall form generation and how these domains aided each other by not treating them separately as individual entities. These wilful interplays between both domains allow a different approach toward design creation, exploration, and communication. The process of translation turns itself into a creative act, and the designs become *objets créateurs*.

Artists and designers have always pushed media to a new definition of both the media themselves and of their artwork. Frank Lloyd Wright's Guggenheim Museum demonstrates how architectural design is not limited in which we can design, understand, and perceive buildings in detail, gestalt, and function (Osman 2001). The wilful exploration of design methods resulted in an innovative architectural expression. In fact, today we can make use of a completely new set of interpretations with new potentials and translate them by using current technologies of digital design and fabrication together with new physical representation methods.

## 6 CONCLUSION

Traditionally there has always been a gap between the new technologies and their applications to develop innovative architectural design. The technological progress promises to advance the way architectural design is developed. Yet architectural design methods generally do not effectively implement much of the technological knowledge and innovative techniques. Digital media are used to reduce time and effort normally associated with physical media and, therefore, just replace and clone the analogue tools. Subsequently, the applications of new technologies to architecture stay behind their full potentials and contributions, which they can offer to the design development. The resulting designs become *objets copiés* of themselves. Despite this, we can observe how a growing number of professionals and schools have deliberately embarked on a new understanding and communication of architectural form creation and design processes. Media are applied outside their normal pre-described purpose, and innovative design methods are deployed by interplaying with the various media and crossed over domains. The designers are enabled to create *objets créateurs* by using the physical domain in its own right and expanding the development into virtual realms that complement rather than reproduce the design.

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