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## A structural metaphor of techniques from music to architecture: contrapuntal tools in the design studio

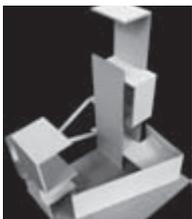


*Não cessa de me estimular a divagar sobre as artes  
Aproximo-as, distingo-as, desejo ouvir o cantar das colunas e  
configurar-me, no céu límpido, o monumento de uma melodia.  
Este imaginar me conduz muito facilmente a situar, de um  
lado, a Música e a Arquitetura: de outro, as demais artes*  
(Valéry, 2006, p.73)

Architecture has historically more common elements with music than with the other arts. Their kinship lies not only on their mathematical base but also on their similar structural formation, compositional tools and terminology. Additionally they convey meanings and are perceived and experienced in space and time. Their relations are the object of people's quest that dates back to ancient Greek mythology. During history many architects approached their art through music. Each one in his own way, expresses both arts' metaphoric relations, or focuses on their similarities on a perceptual level, or invokes the emotions created by them or even focuses deeply on their structural similarities (Demiri, 2011, p.49). In every case there is a common belief that elements such as form, structure, mathematics, rhythm, harmony, colour, articulation et al constitute the basis of both arts.

Our approach in the elective course entitled 'Architectural and musical interrelations: counterpoint as a tool of synthesis in music and in architecture'<sup>1</sup> is structural and can be a useful complement to the teaching in the design studio. Our firm belief is that the abstract ideogram of *structure* and not *form* allows the conceptual bridging

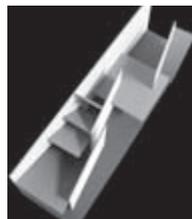
that connects the process of composition between the two arts. Our view is related to the structure of the synthesis considered "as an invisible law that places the elements of a system in relation to one another" (Valena, 2011, p.7). From this point of view musical composition is also linked to structural thinking as it is associated with a system of elements and their linkages. In general, the art of manipulating a system of interrelations through which the whole is composed by its parts is named *counterpoint*. In music *counterpoint*<sup>2</sup> is the art of combining two or more distinctive voices during the flow of time. In order to develop and arrange this kind of relationship between the voices in a musical sense, several conditions must be served, such as a satisfactory writing, distinctness and consistency of each voice, existence of common morphological and stylistic elements between them, and satisfactory harmonic background. The importance of this tool is exemplified in the comment of Reed and Steinke who pointed out that the study of counterpoint is an extremely important part of composer's training "that provide[s] him with the tools he needs to construct and develop his melodic lines and help[s] him to erect a musical structure which has consistency and coherence. Without these tools he may continually find himself in the position of having plenty of ideas but wondering what can be done with them" (Reed & Steinke, 2003, p.IX). In our course music is regarded neither as a mean of inspiration nor as an image-transcript but as a source for a method of synthesis. The focus on the musical pieces is on the underlying principles of composing its elements to form a whole.



1. Model made by students V. Daskalaki & M. Paxi.



2. Model made by students G. Pitsikakis & Koutsaitis.



3. Model made by student P. Mavridou.



4. Model made by student I. Zografopoulos.



5. Model made by students S. Diskou & F. Bougatsou.



An analysis of counterpoint techniques in music precedes their application by our students in small abstract experimental syntheses. Already since the end of the Middle Ages the polyphonic writing becomes more composite enriching the method of counterpoint with a set of techniques, which increase the composer's capability and flexibility during the handling and creation of the music material<sup>3</sup>. The most common techniques are: *repetition, imitation, sequence, transposition, contrary motion, stretto*<sup>4</sup>, *canon*<sup>5</sup>, *retroversion or invertible counterpoint*<sup>6</sup>, *organ point*<sup>7</sup>, *augmentation-diminution, retrograde motion*<sup>8</sup> and *variation*.

The students after the analysis of contrapuntal techniques in music and through architectural examples are asked to apply them in a small design exercise. This is not a complete project like that in design studio but like a practice routine in music and not the whole performance. It helps the students to explore relations of the compositional elements of space exceeding their material, functional and constructional status. They have to design an open synthesis that allows the movement, includes two stases and expresses different emotional feelings. The proposal should be inscribed in a virtual stereo of 40x10x10m considered as vertically or horizontally extended (fig.1-5). The applied contrapuntal techniques relate elements concerning a) the supporting components e.g. linear (beams, columns) and surface (slabs, panels), b) the transparent and opaque surfaces, c) the materials in terms of texture or colour and d) the alternation between shadow and light. The abstract character of the exercise implies the movement to occur in a *non-place*. In other words no functional character is attributed to this composition and there is no relationship with any context.

This exercise that takes place in the School in a form of a short intensive workshop, trains students to explore basic mechanisms related to the structure and investigate fundamental design concepts, principles, and elements. They focus on the creation of architectural forms and spaces through an exploration of contrapuntal relationships and take into account the notions of hierarchy, organization, scale, proportion, materials and light. The whole synthesis should have a clear compositional idea underlining its totality in an overall manner.

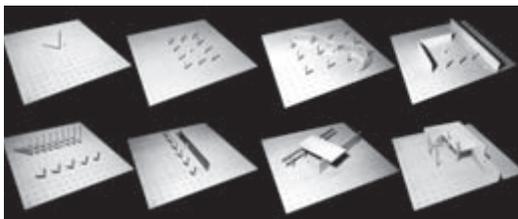
In the introductory course of the architectural synthesis a metaphor<sup>9</sup> of contrapuntal tools is attempted to help students investigate primordial relations and the fundamentals of architectural design. The synthesis is perceived as a unique phenomenon that connects as an entity the human creative action part of which is architecture. At an appropriate stage of the design process, they investigate through small, abstract exercises the role of structural approach as an important aspect of their synthesis. In order to stress the significance of basic spatial components and their role, the project is intentionally detached from other equally important contextual parameters (e.g. social, historical, economic, etc.). The creative process is largely based on the educational model (fig.6) conceptualized by Emeritus Professor T. Biris, and is part of his wider compositional approach. This is an experimental *abstract* application of primary spatial formations. Theoretical issues are also explored such as the

notions: *conceptual idea, compositional structure, geometrical shape* and other *components of form*, their relationship and the mechanism through which the idea is gradually materialized.

The relationship between the *element* and the *whole* is studied (Gärnshirt, 2007), while the primary elements of the articulation of space are defined within the system in relation to a surface of reference: the column (point), the beam (line) and the structural wall or the slab (surface). Various interrelations are also presented between the above structural elements since they formulate examples of primary spatial configurations<sup>10</sup> (fig.7). The contrapuntal relations articulated from the structural elements deriving from different ideas create a syntax that produces a corresponding kind of space. An emphasis is given on the distinction between load and non load bearing elements and on the way they are contrapuntally interrelated. Furthermore, notions are explored such as: movement, stasis and opposing pairs of spatial qualities regarding materiality, lighting, scale and other. Along with these exercises, we present various spatial structures deriving from different conceptual ideas, such as the fluid space, the "open" form, the *Plan Libre*, the "closed" form, the *Raumplan*, the sliding or articulated surface elements, the relationship between levels in section *et. al.*

The above methodology resembles to the analytical approach of *elementary composition*, and the abstract elements of form considered as the basic learning tools of W. Kandinsky's instruction for the preliminary course at the Bauhaus. His teaching method was based as R. Wick presents, on the inseparable relation of *analysis and synthesis* (Wick, 2000, p.197) and the introduction of the primary elements of painting creation: e.g. point, line, their contrapuntal relation and also their relationship with the plane (Kandinsky, 1926). Similarly, our students investigate with *open working models* (fig.8) the relationship *element-whole* through the structural system joined with their idea. The term *open* reveals the dual role of the model; on the one hand it offers the opportunity to study the space and its elements from an *inside view* and on the other hand it attributes to the project a quality of the *semi finished* i.e. of the continuously evolving drawing. Moreover, the *working model* is an important educational tool that cannot be replaced by any other means and allows the student to activate and cultivate the relationship *hand-eye-mind* or else the relationship between practice, perception and cognition, while simultaneously studying *in situ* the gradual birth of form (*learning by doing*) or as Schön describes the educational procedure *reflection-in-action* (Schön, 1987). The knowledge offered in this studio is considered as a necessary linguistic infrastructure and not as prescription. Students later on in their studies, when they *synthesize* in a more complicated manner (fig.9), they develop this initial knowledge; they criticize or even question it.

In an intermediate studio level the students are engaged in a project in a certain context for particular users that simulates the complexities of real life projects. In the second semester of the third year of their studies they are asked to make a synthesis of a public building incorporated into the urban tissue of special architectural character. The first step is to



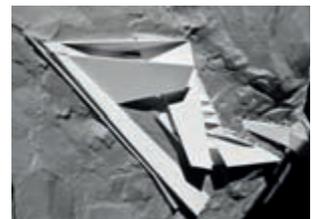
6. Educational model of Prof. T. Biris. Primary spatial formations.



7. Model made by student G. Anagnostakis.



8. Model made by student St. Throumoulopoulou.



9. Model made by student F. Zapantiotis.

read and interpret the context with its multifaceted nature including its physical and non-physical aspects. Additionally, they take into account the functional requirements and consider structural and technical matters. The interpretation of all complex data is a selective process which helps students to set the rules and priorities for the next stage of thought that is the formation of their conceptual idea. This idea is close to Schoenberg's musical idea which "served as center for the notions of coherence, unity and logic that pervade his thought about music" (Carpenter, 1983, p.15). The concrete and technical aspect of the idea is the *grundgestalt* [basic form] (Ibid). Concerning architecture, T. Biris uses respectively the terms conceptual idea and compositional structure (Biris, 1998). This conceptual abstract structural ideogram that gives coherence to the whole is expressed by our students mainly with sketches (fig.10), even gestures and narratives. The model (fig.11-13) at this stage is important as an educational tool because it helps students to visualize their idea and the compositional structure in a three-dimensional manner incorporated into its context. The relationship of the new project with its place is a basic contrapuntal action. The dialogue established with the context is vital to the architectural synthesis since it includes, as a seed, the students' view on how they conceive their building as a whole entity related to the place. Each student's approach interprets the different features of the reality and seeks to reveal diverse aspects of it. This is due to the fact that every one possesses a *habitus*.<sup>11</sup>

After various trials students proceed gradually with the articulation of the formal structure of their proposal by handling basic elements and relating them through compositional rules since "in principle any formal structure can be analysed in terms of elements and relations" (Norberg-Schultz, 1965, p.148). The proposed elements are lines, surfaces and volumes. These geometrical entities constitute the basis of the synthesis of spaces and as P. Zumthor stressed, geometry that helps us understand how to handle space in architecture is about the laws of lines, planes, surfaces and three dimensional bodies in space (Zumthor, 1998, p.21). The openings considered as transparent surfaces can transform a volume to adjoining surfaces and a surface into a sequence of linear elements. Counterpoint offers the tools to explore the relations between the elements (fig.14) additionally to the transformational rules applied to them (e.g. intersection, overlapping, folding). Contrapuntal techniques can be applied in plan (e.g. relationship between supporting structure and infill elements), section (e.g. relationship of floor and roof), facades (e.g. organization of openings, colour and materiality of elements) and volumetric articulation (in terms of size, form, development). It is important for the students to express their conceptual idea in a holistic manner and not in a fragmentary way.

"Whereas the entire process in the studios is linear [...] is composed of iterative spiral loops" (Goldschmidt, 1983, p.10) and students very often have to evaluate and rethink their decisions. Towards this end, 'open crits' help them. In these, all students participate under our guidance and express in a dialectic manner their *pros and cons*. The open critique of all projects feed their imagination with the ideas of the others. Additionally, the common working space with students from other studios of the advanced level<sup>12</sup> serves as a stimulus between the groups.

Our approach in both studios is exploratory and non prescriptive. It is open to criticism and continuous revaluations and as Gänshirt eloquently comments "what must be avoided at all costs is to constrain design in a predefined methodology. On the contrary, the world of design should be understood as open and at the same time as complete in itself, as a realm containing a wide variety of languages and of forms of thought and work" (Gänshirt, 2007, p.17).

The outcomes of the experimental teaching method in the music course show that the abstract exercises help students to organize their thoughts and explore their design ideas. As an ex student comments: "The course creates various thematic lenses, under which the procedure of architectural synthesis can be seen, or studied. Furthermore, it functions as an analytical tool that promotes structural thinking and comparisons, the conception of which ultimately helped me on individual work produced in the Design Studio. I often come to think that various procedure themes of synthesis, such as musical schemes -as an emerging condition- often re-qualify architectural design. Moreover, as I perceive it and what I have valued the most is that, the course succeeds to create a conceptual space between Music and Architecture, allowing them to interact and affect their individual meanings, while expanding their capacity to contain their diversity and complexity; but nevertheless, leading to a deeper understanding of the process of synthesis itself" (A. Stathopoulou).

Concluding, as preparatory exercises, they should not be considered as an end in themselves restricted to the exploration of formal relations. As opposed to Ghirardo's view (Yanar, 2007, p.77), the geometrical play of forms is not an autonomous activity detached from the social and other equivalent concerns when it is approached as a complementary action to the investigation of the social, economic and cultural framework where the new architecture is incorporated. The view of C. Norberg-Schultz that: "Architecture itself is a cultural object. It is a human product serving common human activities" (Norberg-Schultz, 1965, p.122) echoes Paul Valéry's statement that music and architecture are two arts that enclose man inside man or rather they limit the being inside his work (Valéry, 2006, p.77).



10. Social market. Sketches made by students A. N. Katsouli & M.k. Zaxou.



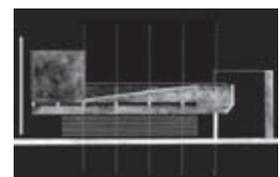
11. Social market. Model made by students A. Axaopoulou & E. Pertigiozoglou.



12. Social market. Model made by students G. A. Skorletou & X. K. Tzeveleku.



13. Social tuition school. Sketches and model made by students X. Kiourti & X. S. Mitselou.



14. Schematic elevation made by student I. Zografopoulos.

1 → The course is addressed to the third year students of the School of Architecture and the teaching team includes, apart from the authors, the Emeritus Professor T. Biris and the architect-musician A. Angelou.

2 → The term originates from the Latin punctus contra punctum, which means ‘point against point’.

3 → Most of contrapuntal techniques consist of the alteration of an initial prototype motive. Despite all the differences between the musical aesthetic perceptions of the historic periods, the contrapuntal techniques constitute, especially after Bach’s refinement, the basis of the polyphonic writing until the 20th century.

4 → Overlapping imitation of a motive from the second voice, which begins before the first voice has completed its statement.

5 → Imitation of a melody by one or more voices after a given time at a particular interval.

6 → Mutual inversion of parts, so that the upper part becomes the lower and vice versa.

7 → Continual sound of a note presented from one voice, while the others move freely.

8 → Reproduction of a motive or musical phrase in symmetrical-reverse order.

9 → According to the Webster Dictionary the meaning attributed to the term metaphor derives from the Greek: μεταφορά – metaphora, “a transfer”, in rhetoric “transference of a word to a new sense”, from μεταφέρω – metaphero, “to carry over, to transfer”.

See extended definition in <http://www.websters-online-dictionary.org/definitions/metaphor>

10 → For example, the contrapuntal relationship between columns and walls form an arcade (a linear space of movement) where as the centrally organized columns and walls articulate an atrium (a space of stasis). In parallel primordial notions are analysed such as the axis, the rhythm, the scale, the proportion etc (Biris, 1996).

11 → Habitus is described by Bourdieu as “a system of dispositions, that is of permanent manners of being, seeing, acting and thinking, or as a system of long-lasting (rather than permanent) schemes or schemata or structures of perception, conception and action” (Bourdieu, 2005, p.43).

12 → The social dimension of design and the communication as a core issue in the design studio is discussed in Wang, T. (2010) A New Paradigm for Design Studio Education, International Journal of Art & Design Education, 29: 173–183.

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