

The study of form structuring through musical rhythm analogies for architecture students

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Abstract. The aim of the study is to facilitate the rhythmic management of shape by understanding the basics of the sonorous rhythm. The method used is based on an exemplification using musical instruments, audio tools and a specific/ intuitive rhythmical semiography. This theoretical part is applied in the discipline called “The study of form”, conducted at the Faculty of Architecture in Timisoara, in the 2nd year of the bachelor programme using an exercise entitled rhythmical volumetric frieze. The method and results are presented in the illustrative part of the paper. Understanding musical rhythm is a fertile base for those working in the field of architecture, design and visual arts in general. The formal diversity obtained exhibits the polyrhythmics and the variation specific to musical rhythm, contrary to monorhythm and isorhythm.

1 Introduction

The full association of the idea of rhythm with repetition and, especially, with the equal and identical repetition of a single element is the main cause for rhythmic scarcity of architecture because it reduces the potential of a highly fecund language element to its most trivial and primitive version. The phenomenon is due to the confusion that most [1,2] make between rhythm and measure, between rhythmics – the living component of musical rhythm – and metrics – the virtual component represented by bars and metric accents repeated, indeed, at equal intervals, but whose voicing is not mandatory, a confusion sometimes made by musicians, too. In other words, musical rhythm can occur unevenly on equal measures without disturbing the order and symmetry imposed by metrics. The only period in which rhythmic emphasis (ictus) overlaps with the metric one (thesis) is represented by the functional tonal music, generally known as “classical music” (18th – 19th century) where periodic and equal repetition of the rhythmic emphasis was valued aesthetically as the main means of expression, with synchronous or slightly offset correspondences in the period’s architecture.

Music theory tells us that the idea of monorhythm, that is a rhythm consisting of a single element repeated endlessly and similar to the natural isorhythm, does not make sense in music [3]. The monorhythm makes no sense in nature either, because, if we were to consider the ebb and flow as equal in duration, they still do not resemble each other, being

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even antagonistic, and that is why they make up a couple, so a rhythm of 2, i.e. binary. The same goes for systole and diastole, which are not even equal. In the case of the rhythmic formula based on equal note values, rhythmic emphasis will fall on the note to be decided by the other component of rhythm – intensity. If we were to consider the equal repetition of a single sound with the same intensity, note and timbre, where nothing would suggest an emphasis of any kind, we would not obtain a musical rhythm, because in the absence of emphasis musical rhythm has no meaning. The so-called “rhythm of 1” [2] exists in the visual field, where it manifests by the same element repeated at equal intervals, but it is actually a “rhythm of 2” [4]. The rhythm of 1 of a classical colonnade might be translated into a repeating binary rhythmical formula consisting of two beats in which one was replaced by a rest, in which case we would have the simple example of developing rhythm by means of rests, and thus obtain a reconciliation with music theory.

2 Theoretical basis

2.1 Musical definitions

To formulate a definition, it is necessary to treat rhythm at two levels: macrostructural and microstructural. At a macro scale, starting from the etymology of the Greek word *reo* meaning “to flow, to move, to pass”, rhythm represents movement, a succession over time of world phenomena and processes. Movement is the basic principle of the whole world; all processes in the universe known to man are based on dynamic principles. In music, “rhythm means the entire process of movement of all elements of sound” [5], i.e., the succession of all musical parameters (length, frequency, timbre, dynamics, tempo) in their full flow. In other words, at a macrostructural level, rhythm is not only the distribution and succession over time of sound elements perceived as beats, because it also includes melodic movement.

However, at a microstructural level, the definition of rhythm considers only the relationships over time from the sound movement, i.e., “the distribution over time of sounds under the notion of length” [5], musical rhythm being thus considered as an independent and concrete parameter, sounds and rests forming a body which then determines the existence of other movements: melodic, harmonic, polyphonic, dynamic. According to musicologist Constantin Rîpă, “the full definition of rhythm would be: rhythm means lengths, intensities and tempo.” [5]

2.2 General definitions

To have an artistic rhythm, it is necessary to simultaneously fulfill some conditions: some component elements (audio or visual) need to exist; in order to have a succession, there must be at least two elements; there needs to be a development environment; this succession needs to have an organization rule, an order and a variation. In this context, a comprehensive definition of artistic rhythm would be: “the organized and varied succession of elements in space and time” [6].

In the composition of static visual arts, therefore in architecture, too, rhythm refers to the organization of the succession of lines, shapes, sizes and differences, and not to their identical repetition. Identical repetition of a linear, formal or dimensional element does not contradict the meaning of rhythm, but it does not represent a condition there of either.

3 Disabstractification by analogy

The disabstractification of the concept of visual rhythm can be made by sound analogies. The aim of the study is to facilitate the rhythmic management of form by understanding the basics of sonorous rhythm. The method used is based on the examples using musical instruments, audios and an own, intuitive rhythmic semiography.

The raw material of music is sound, so the elements that will make up the musical rhythm will be the sounds with all their physiological characteristics: pitch (note), length (continuity over time), intensity (strength) and timbre. However, rhythm will manage the organization of sounds, intercorrelating their length and positioning on the time axis. The primary elements of artistic language are forms. Thus, in a purely analytical dissociation of the configurational constituents, forms can be distinguished from each other by: size, color, consistency and texture. As the sound's physiological characteristics (length, pitch, intensity, timbre) are contained entirely in a sound unit, similarly the form's physiological characteristics (size, color, consistency and texture) are found in a visual configuration.

To make a full analogy between sound and form starting from the correspondences found in physics of the physiological characteristics of sound is impossible, because, if for forms one can detect a rule for its structuring on the three dimensions of space, the situation is not the same for sounds. We can make analogies between length (continuity over time) and size (continuity in space), sound intensity (volume, amplitude) and visual intensity (poignancy, visibility, consistency), pitch (oscillation frequency of the sound wave) and color (frequency of the electromagnetic, light radiation) [7], between timbre (spectral form of vibrations, exterior characteristic given by the construction material of the sound transmitter and its production technique) and texture or, once again, color, but if a form can contain two or three dimensions simultaneously, sound can only have one length, because time is one-dimensional.

Rhythm has an exclusively linear development in music because of the existence of a single axis, that of time. In two-dimensional arts, it can be deployed linearly or on the surface, and, in three-dimensional arts, it can be deployed on all three dimensions of space, organizing it at spatial volumetric level. From the point of view of the systematics of musical rhythm, notes are organized into simple rhythmic formulas that can be binary or ternary, while heterogeneous rhythms (made of 5, 7, 8 notes, etc.) will be the many possible combinations of binary with ternary. In the bimodular sense of the rhythmic formula in which notes may have two different values, the emphasis will be the long note of the formula. In the case of the rhythmic formula based on equal values (in the unimodular sense), the note on which the rhythmic accent (ictus) will fall will be decided by the other internal component of rhythm – intensity.

Measure in music can be treated as a macromodular system based on a single equal module, represented by the note value of the fraction's denominator (quarter, eighth, sixteenth) and on a number that designates in how many such equal modules is the mensural frame divided. If for the measure in music this module is very suggestively called "beat" and has actually a purely temporal connotation, in the visual field it belongs to size, distance in the physical space. The part of musical theory presented to students does not include the development procedures of musical rhythm (classical, harmonic and rhythmic, melodic and rhythmic) because they belong to the superior theory of rhythm, which is unfortunately accessible only to students from music high schools or faculties.

4 The experiment

This theoretical part is applied to the discipline titled ‘The Study of Form’ from the Faculty of Architecture in Timisoara, Furniture and Interior Design specialization, conducted with 2nd year students by two exercises titled: “Modular Spatial Composition” and “The Rhythmic Frieze”.

4.1 Modular spatial composition

This exercise is based on the analogy between a visual modular system and the divisional system of musical values (Fig. 1a), an analogy on the dimensional growth by addition and doubling in one direction, as in music, in two directions, as in the two-dimensional arts (Fig. 1b), or in volume, as in spatial arts (Fig. 1c).

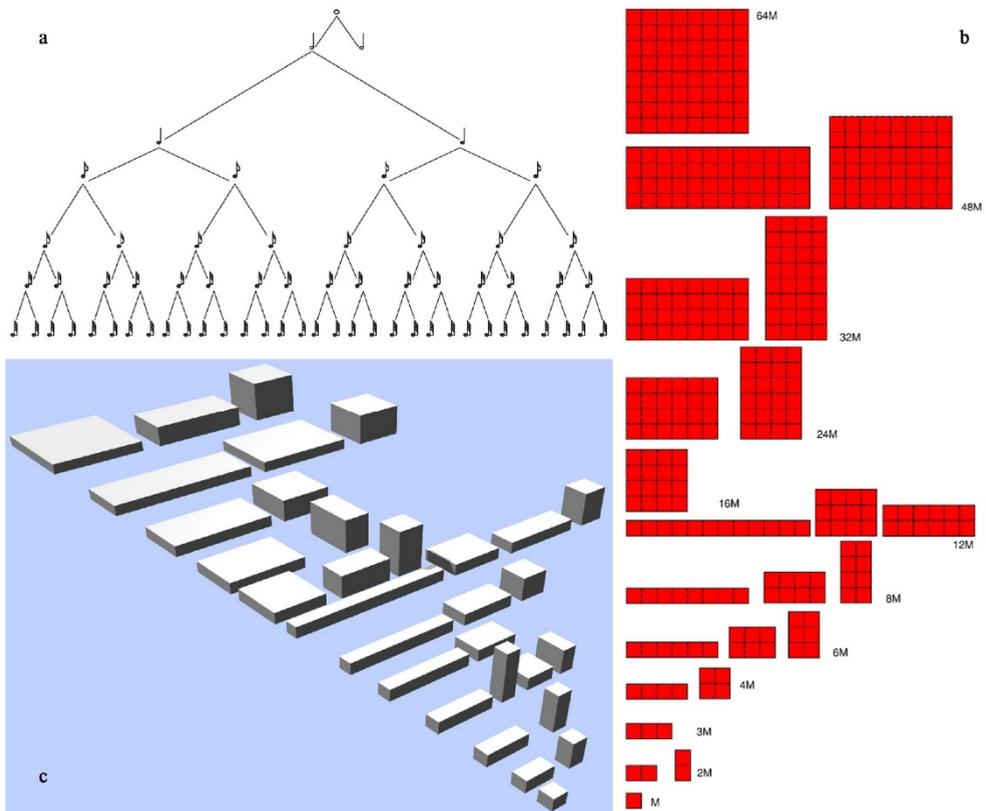


Fig. 1. (a) The divisional system of musical values; (b) bidimensional analogy; (c) three-dimensional analogy

The task: develop a spatial composition in a 32-cm cube, modulated according to a spatial scale relative to divisional proportioning system – similar to the divisional system of music values. The module – the basic unit that divides all volumes – is a 2-cm cube. This cube-module represents the “point”. By adding (or “moving”) in one direction, it describes the “line”. Moving the “line” in one direction perpendicular to it defines the “plan”. Moving the “plan” in a direction perpendicular to it generates the “volume”. The spatial composition shall use all four modalities of expressing form: volume, plans, lines and

points. Working materials: colored cardboard paper (any color), glue. A “point” shall have one color. A “line” shall consist of points of the same color, resulting, in fact, in a square section tubular volume (2x2cm), continuous but divisible by 2 cm; it will not be a succession of little cubes. Identically, a “plan” will be a monochromatic prism with a height of 2 cm, divisible the other two sides by 2 cm, while a “volume” will also be monochromatic. The colors of “volumes”, “plans”, “lines” and “points” shall be different. The underlying grid shall remain virtual; it should not be expressed physically (no support cube, wires, etc. need to be built), but composition must have the statics secured on either side of the virtual cube framing it.

As a preparatory exercise for the ultimate purpose of the experiment, students received the visual examples given in Fig. 1 and Fig.2, plus other similar ones. For this reason, the results were somewhat similar.

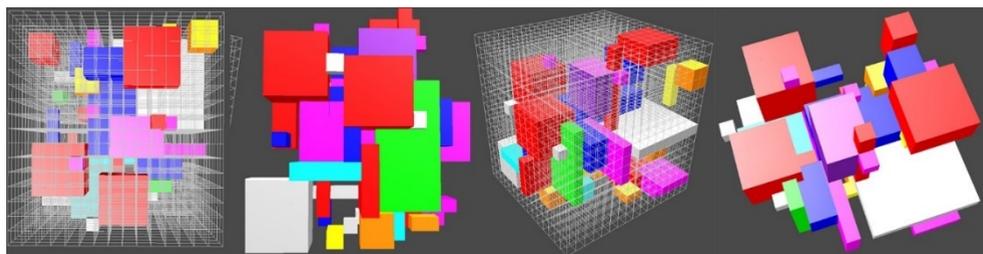


Fig. 2. Visual examples

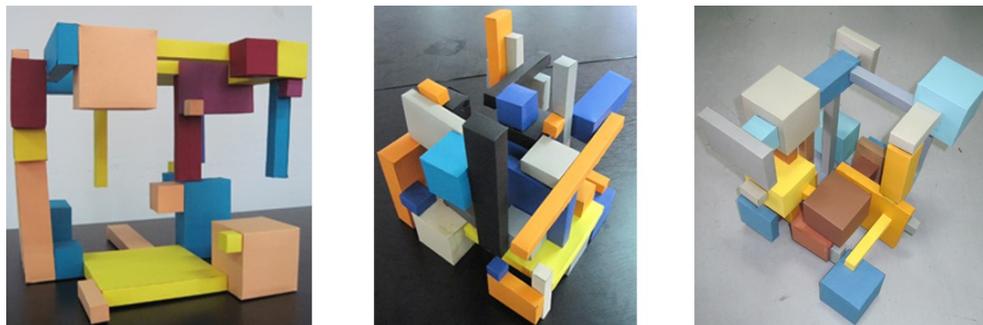


Fig. 3. Student work

4.2 The rhythmic frieze

The task: choose four measures from a favourite song, and translate them into the visual field on a cardboard paper support, showing the movements of the instruments involved in the sound fragment. The students were helped by us to detect the beginning and end of a measure, the beats in the bar and their number, thus observing the difference between the time values voiced in the actual rhythm and the virtual, voiceless beats. Previously, using a drum machine and an electric guitar, we exemplified how on the same percussion rhythm the guitar can perform extremely varied rhythms, and vice versa. Being a rather intuitive exercise, the results were very different, although the measure was identical in all cases, 4/4. They reveal in most cases the time values and dynamic accents of each participant in the song initially overlaid on the divisional metro-rhythmical structure, and then overlaid in different combinations, resulting in the abstract acoustic friezes characteristic to each variant. It is the perception of rhythm at a microstructural level. The similarity with the frieze type is evident due to the predominantly unidirectional horizontal development.

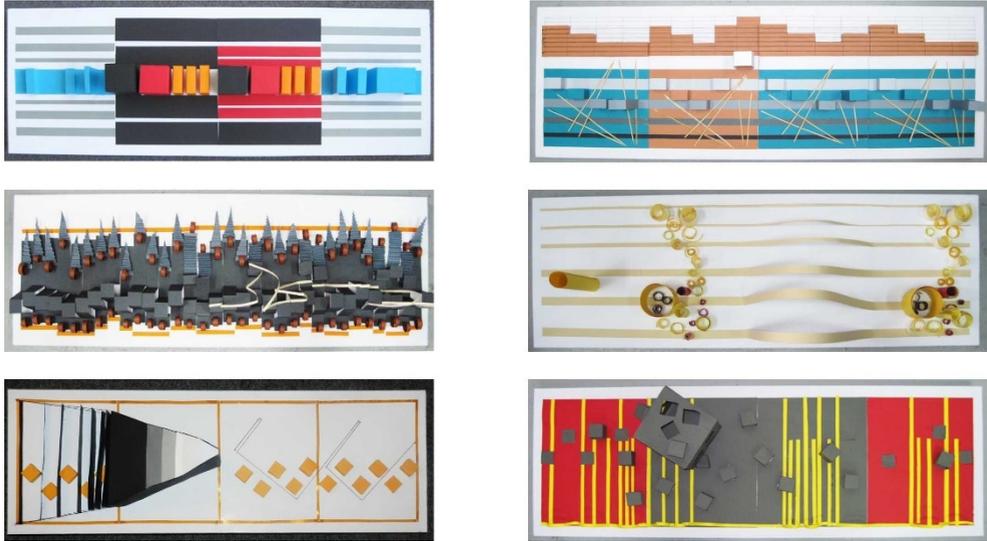


Fig. 4. Student work

However, in other cases, the examples capture rhythm at a macrostructural level, the overall movement of the sound complex, the overall dynamic of sound. In these situations, students have used graphic simulations associated with software used to listen to music on PCs, imitating them in a more or less creative manner. (Fig. 5)

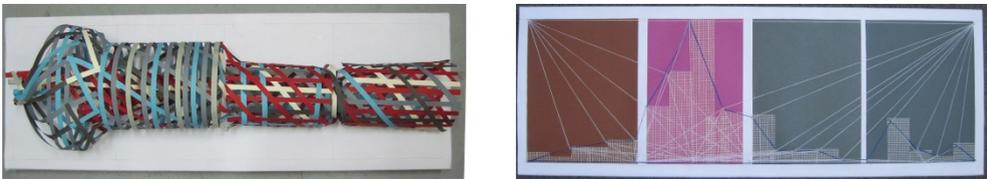


Fig. 5. Student work

The results also confirm notes by Richard Wallaschek (1860-1917), known for his contributions in the fields of comparative musicology and music psychology; he noticed that people perceive music in different ways: some appreciate the musical ensemble of a performance, even if it contains errors; others tend to notice only certain musical elements, beats or chords, while the whole eludes them. Transposing Wallaschek's theory in the visual field, we see an obvious similarity.

5 Conclusions

It is wrong to believe that a rhythm is strictly what is performed by percussion, because each instrument contributes to the interpretation of a musical segment that has its own movement, its own sound dynamics. Similar to music, in architecture and fine arts, in general, we can detect overlaps of multiple rhythms in the same work.

In a multiple instrument or voice composition, the melody of each of these is seconded by its own rhythmic line, except where they would all play in unison, i.e., the same notes using the same rhythm. Polyphony has managed the overlay of different melodies, and polyrhythmy dealt with their rhythms in the art of counterpoint which organically connected them without cancelling their individual meanings. Contemporary electronic

music, acoustic and electro-acoustic runs on the same principles, without denying (most times) the real function of measure.

The fact that the students discovered intuitively polyrhythmy by analogy with music is a step forward for the recovery of rhythm as morphological and syntactic language element to its true potential, unfortunately manifested only in the field of sound.

Understanding musical rhythm represents a fertile base for those working in architecture, design and visual arts, in general. The diversity of results obtained illustrates the polyrhythmy and variation specific to musical rhythm, contrary to monorhythmy and isorhythmy.

References

1. P.A. Michelis, *Eстетика архитектуры (The Aesthetics of Architecture)*. București, (1982)
2. Y. Hasan, *Paul Klee și pictura modernă, studiu despre textele lui teoretice (Paul Klee and Modern Painting. Study on His Theoretical Texts)*. București, (1999).
3. V. Giuleanu, *Principii fundamentale în teoria muzicii (Fundamentals of Music Theory)*. București, (1975)
4. A. Racolța, *Sincretism vizual și sonor în ritmurile arhitecturale (Visual and Sound Syncretism in Architectural Rhythms)* Timișoara, (2014)
5. C. Rîpă, *Teoria superioara a muzicii, volumul II – Ritmul (The Superior Theory of Music, Volume II – The Rhythm)* Bucuresti, (2002)
6. A. Racolța, *Rolul ritmului in generarea formei arhitecturale (The Role of Rhythm in Creating Architectural Form)*. Forma-Formare-Sens. 281-295. Timisoara, (2013).
7. W. Kandinski, *Spiritualul în artă (The Spiritual in Art)*. București, (1994).