Spatial Forms Generated by Music – The Case Study

Mirjana Devetakovic Radojevic, M.Sc.
Faculty of Architecture, University of Belgrade, Yugoslavia
e-mail: eaoyu@ptt.yu

Raewyn Turner
Multi-senses Artist, Auckland, New Zealand
e-mail: r.turner@clear.net.nz

Abstract

This paper resulted from the first stage of an ongoing collaborative research between a multi-senses artist (R. T.) from New Zealand and an architect interested in generic architecture (M. D.) from Yugoslavia. The research examines potential relations between music and architecture and explores the ways music could be a source for generation of spatial forms, and vice versa, whether architecture might generate music. In the first stage of the research two different existing generic principles were combined. The graphical interpretation of the music served as a pattern for creating the spatial forms. In this experiment the Brahms's Hungarian Dance No1 has been used as an initial generator. The music is transformed into the sequence of linear drawings. Every single drawing potentially defines a spatial composition, while each single line represents an axis of the future spatial form. Together with geometric definitions there are some ambient values, like color, transparency and many others, that can be determined by music. After an overview of results, paper concludes with perspectives for future research that will include time as an additional dimension towards generating dynamic spatial concepts based on music.

1. Introduction

There are many interpretations of interdependences between music and space, especially of the space materialized in architectural form. Contemporary musicians receive commissions to write pieces of music for important events or even for particular buildings. One of the most recent examples is the Philip Glasses *Dancissimo* created for the new addition of the

Milwaukee Art Museum. In an interview for Architectural Record Philip Glass discusses the process of writing music for architecture:

"There's a feeling - the idea is something to do with the idea of the structure of architecture and the structure of music. In architecture the structure is overt. The structure and function: isn't that the whole idea of modern architecture, that structure and function are very connected? That, of course, is the secret of music: that structure and function - what we call content and structure, which I guess is very similar - the emotional content and the structure of music are very close. So there's always been that kind of funny bond between architecture and music to begin with."[2.].

Figure 1 Santiago Calatrava – Milwaukee Art Museum, Wisconsin, USA, the building that provoked composer Philip Glass to create a piece of music.

In another interview, related to his famous building "Tower of Winds" Japanese architect Toyo Ito discusses a possibility to translate architecture into music:

"I have been wanting to create an architectural space that is like a space in musical sound. The system in configuring sounds in music is determined by the composer. But how the player takes them each time makes a lot of difference in the spatial sound of the music created. Moreover, sounds die away, as time goes by. I would like to create such an architectural space. So I think virtual architecture existing in my consciousness can be well translated into something like music. But in reality, once a building is constructed on earth it can no longer be translated into music. I myself feel betrayed, as soon as I see a completion of my   work.

But after all, music as well as architecture is a visualization of the time and construction of space. I hate to see the space in architecture freeze and continue to exist for a long time" [1].

Figure 2 Toyo Ito - "Tower of Winds", Tokyo

2. Combining the Two Generic Principles

In this project the two researchers from different fields (multi-senses art and architecture) combined their generic methods with aim to create a system of the spatial forms based on the music. The point of superimposition of these two processes was the particular stage where the graphical component explaining the music, become a guideline for generating the future spatial forms (Figure 3).
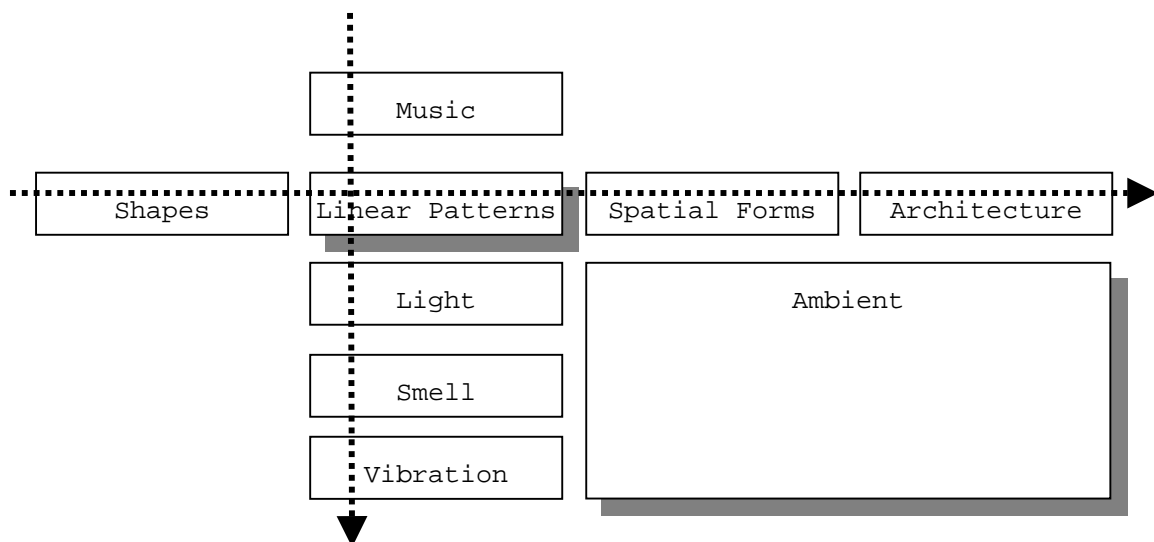

Figure 3 A Superimposition of the Two Generic Principles

The piece of music chosen for this project is Hungarian Dance No 1 by Johannes Brahms, well known and easily recognizable of its rhythm and dynamics.

2.1.   Transforming Music Into The Light

Our nature and the things that we create, mirror the nature because we are inside nature. Gyorgy Doczi writes: "The basic pattern – forming process of proportional harmonies in nature shapes human creations; simple proportional relationships that create patterns in Nature and the arts".

In this translation of Brahms Hungarian Dance No1 into coloured light the artist is experimenting with the imaginative vision of association triggered by sensory factors and the creation of a simulated synesthesia.

Brahms Hungarian dance No1 was recently included the multisensory Four Senses Performances with a symphony orchestra[1]. The artist used the stage lighting states that she had composed for this piece in performance as the basis of the color animation video that she created for this research.

The Brahms Hungarian Dance No 1 was translated into light by making an intuitive drawing (Figure 4) as a visual representation of the sound. This involved her perception of the phrases of the sound, which were coded into light, the pauses into dark, thus applying the method of correspondences between sound/silence, and light/dark.

00'03"   00'06"   00'09"   00'12"   00'15"

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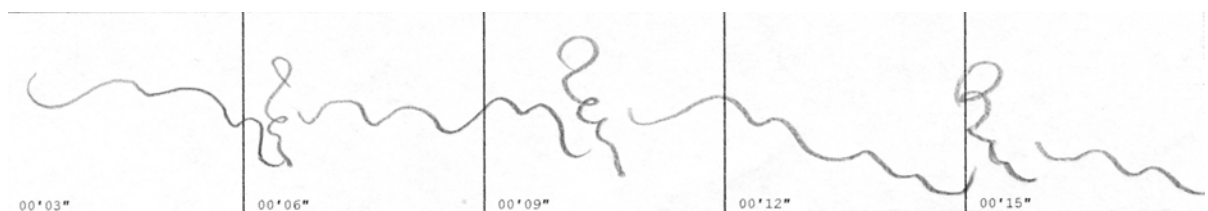
[1] The concerts for the deaf, "Four Senses Concerts", series of performances explores the interrelationship of inner and outer reality and the imaginative vision of association triggered by sensory factors. "Four Senses Concerts" (1999, 2002) series of performances in Auckland, New Zealand, with the Aotea Youth Symphony Orchestra also included mixed ability dance group Touch Compass, a deaf singing choir Hhands and sight-impaired vocalist Caitlin Smith.

Figure 4 Sequence generated of the first fifteen seconds of the Hungarian Dance No1.

The sequential colour states were composed using the sound drawings intuitively suggested to the artist by the phrases of sound. The pre-programmed light states for the theatre performance of the Brahms Hungarian Dance No 1 were created with a lighting plan and a PC based stage lighting program to make multiple sequences and cues used in improvisation.

The canvas of the whole orchestra was composed using saturated colours to achieve high degrees of retinal stimulation, brightness and afterimage.

According with the method which Raewyn Turner developed while working on a project with the New Zealand Symphony Orchestra during 1998 and in an earlier experiment with the Melbourne Symphony Orchestra, Australia, the orchestra is divided into sound groups each of which is assigned a colour and its complimentary (Tab.1).

Tab.1 The colours assigned to the groups of instruments of the symphony orchestra

Instrument	Principal colour	Complimentary
1st violin	Magenta	Deep blue-green
2nd violin	Violet	Deep amber
Viola	Medium blue	Orange
Basses, cellos	Deep blue-green	Magenta
Drums, percussion	Light red	Pea green
Sax, trombone, tuba	Lemon	Lavender
Trumpets	Deep amber	Violet
Clarinets, flutes, bassoon, oboes	Pea green	Light red
Horns	Orange	Medium blue
Piano	Bright rose	Sea blue

There were tactile cushions and balloons available in the auditorium (1000 seat of the Dorothy Winstone Theatre) for those with hearing disability.

The translations form a methodology in which one medium has been related to another. The correspondences established between sound/silence and colour/light/dark are creating systems and structures as a way of negotiating reflective and subjective connections between sensory experiences.

2.2. Generating Virtual Forms Based on Spatial Guidelines

The second generic principle is focused on creation of spatial (architectural) forms based on two primary variables - a shape that defines the cross-section of the future generated element and the guideline that serves as an axis along which we generate the spatial form.

While for the first element we chose simple shapes like square, rectangle or set of rectangles, the second element is more demanding and requires a definition of generic source for its creation. This generic source can be found on particular site (contour lines), can be predefined by urban planning requirements or urban context (roads, walkways, views…), by built environment, etc. In this case we used the music translated into drawings as a generic source for the spatial guidelines.

On this stage of the generating process the main issues were:

- Determination of the scale for the generated form, i.e. the ratio between the size of an initial shape and the line of generation.

- Finding the way to represent the duration of the particular sequence, within a static spatial form.

- Initial materialization of the form.

3. The Process

While applying the chosen shape that will define the constant cross-section of the generated form there are the two main properties, the scale that determine the future character, and the density, that represents the initiation of the future materiality of the spatial form.

3.1. Exploring the Scale and the Density of the Generated Form

The size of the shape that is used in the process of basic form generation, compared with the length of the spatial line defining the axis of the future form, determine the scale of the future form, which can be "geographic", "urban", "architectural" or "sculptural". The most important in this case was the architectural scale where generated form got an architectural character.

The property of the generated form that we call the density is appropriate to the linear, "wire frame" representation of the generated form and can be treated as opacity, or transparency. In fact, it defines how expressive is going the future form to be, and it will depend on the intensity of the sound.
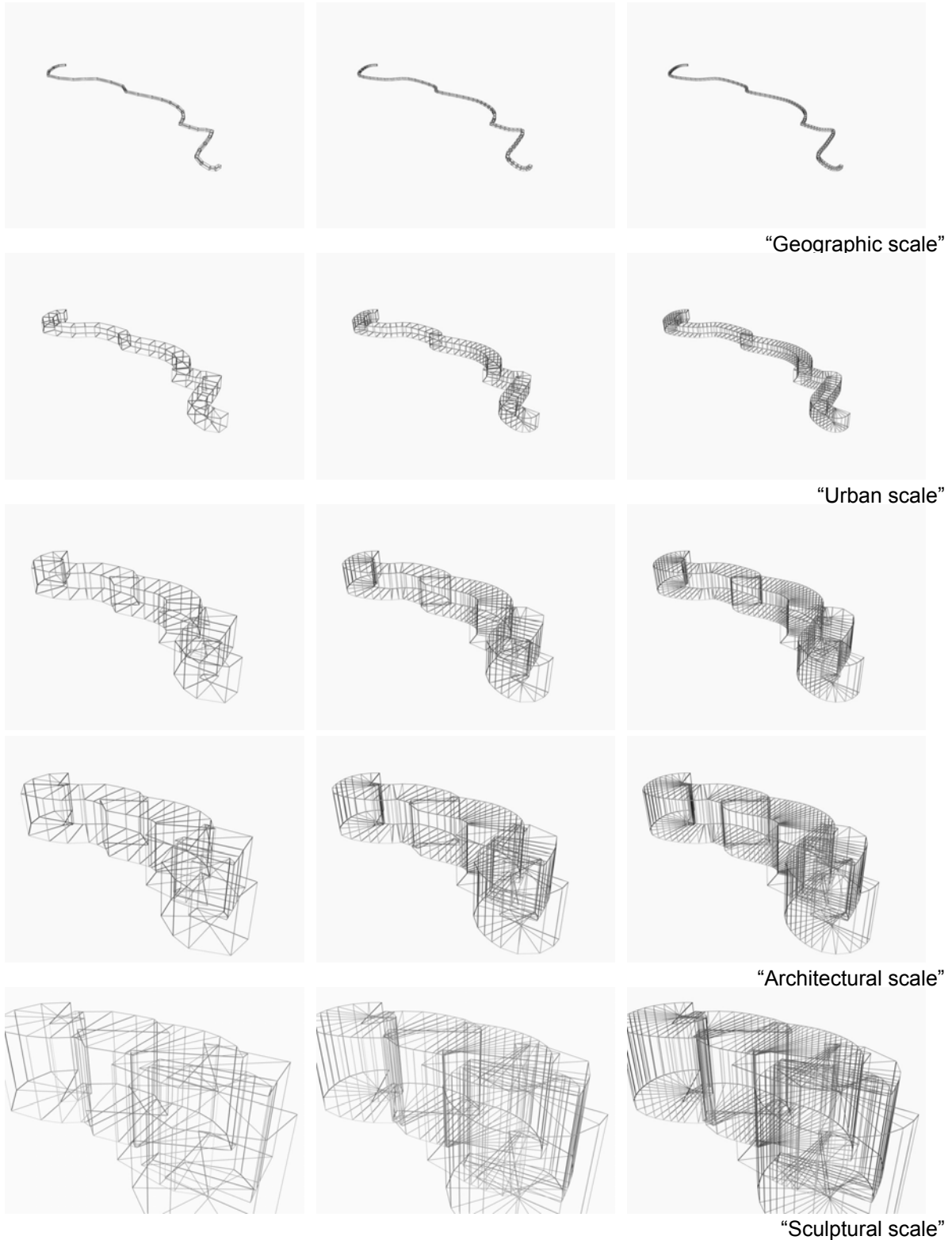

"Geographic scale"

"Urban scale"

"Architectural scale"

"Sculptural scale"

Figure 5 Examination of the scale and the density of the generated form.
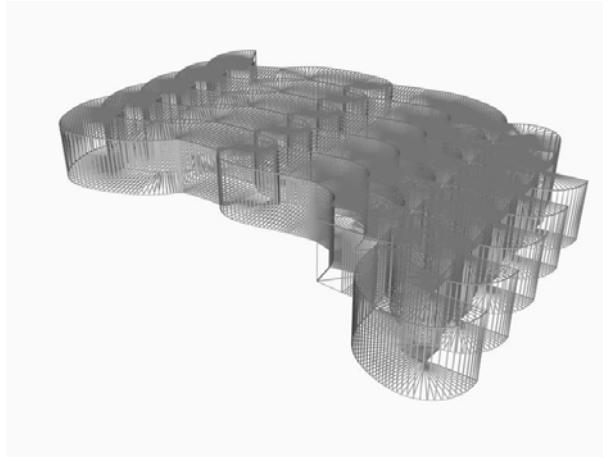
3.2.   Genesis

Figure 6 Genesis - Step 1; Duration of the sequence represented by multiplication of the form
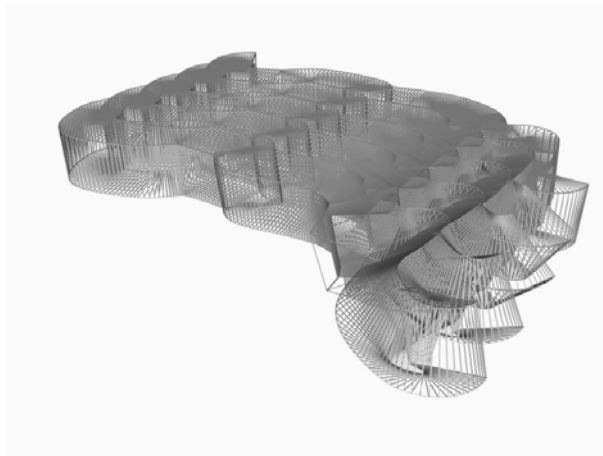

Figure 7 Genesis – Step 2; The part of the music accent transformed into the dynamics of the spatial form.
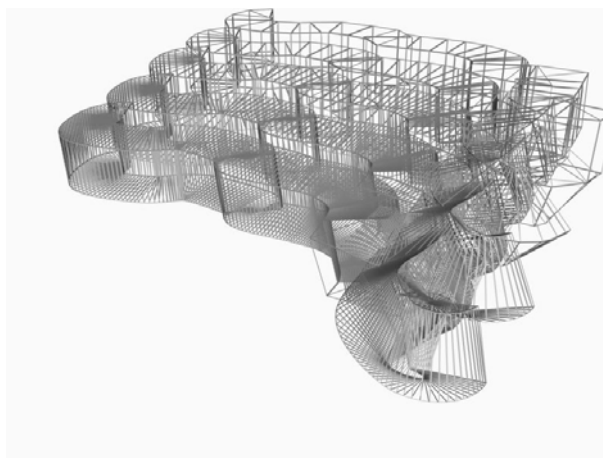

Figure 8 Genesis – Step 3; The intensity of the sound determining transparency of the generated form.

The set of images on the previous page (Figure 6 - Figure 8) illustrate the genesis of the spatial form based on the graphic representation of the first five seconds of the Hungarian Dance No1 (Figure 4), and the square shape applied in the "architectural scale". In the Step one (Figure 6) the duration of the music phrase is represented by multiplication of the basic generated form. The step two (Figure 7) shows the influence of the music accent at the end of the music phrase, represented by dynamics of the multiplied form. Finally, in the Step three the intensity of the sound determined the transparency of the particular parts of the form.

4. Spatial Expressions

The most exciting part of this process is the possibility to explore the generated spaces. Represented just by their linear frames, they allow full imagination of materialization and possible functionalities of the generated spaces. Next series of illustrations aim to show the spatial examination of the generated virtual space.
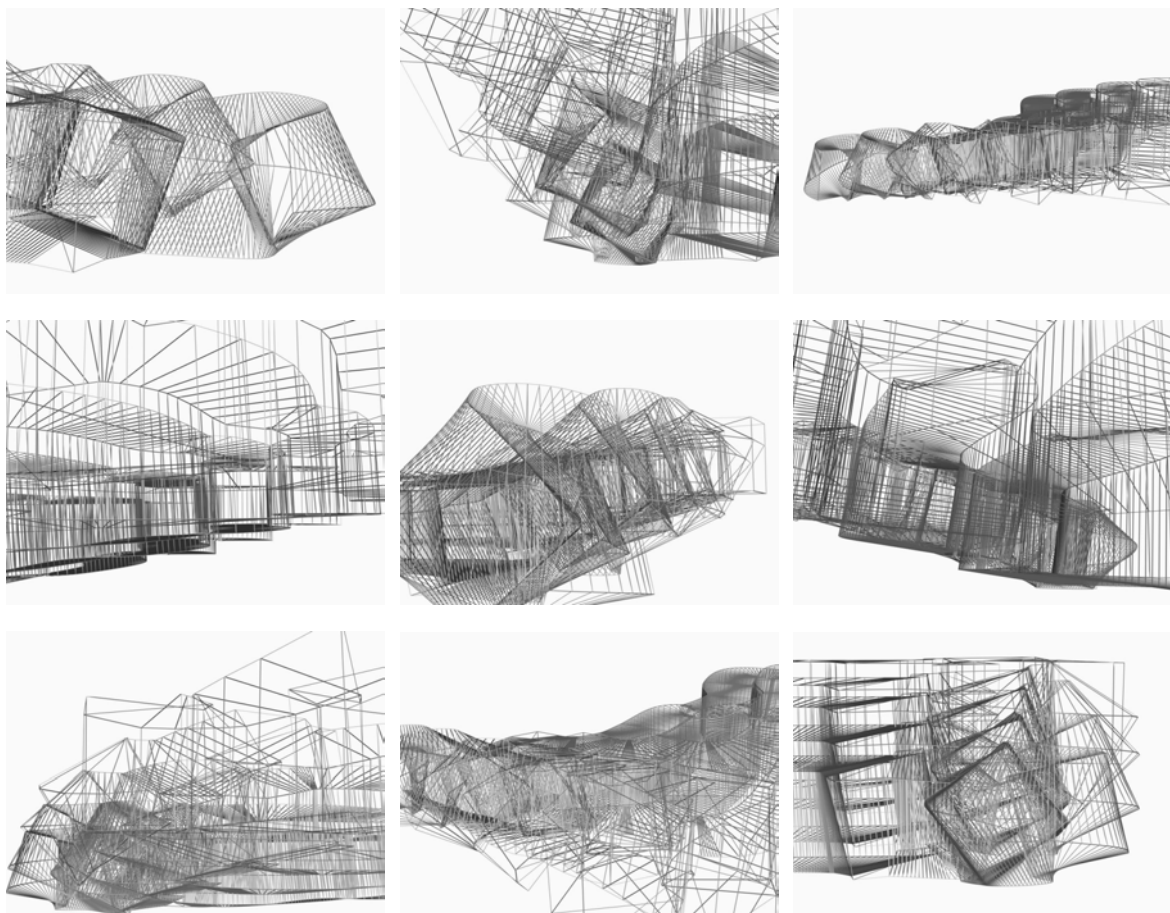

Figure 9 The Spatial expressions of the generated form.

5. Conclusion

The first stage of this research confirms that there do exist huge potentials related to experimentation in form generation based on music. It is completed entirely based on intuitive concepts, almost manually, without any parametric definition. The results are still in domain of "frozen", static form, represented by their linear appearance.

In our future researches we expect to introduce some ambient values like materialization, colour and light intensity, smell, etc. In this stage our intention is to examine introduction of dynamics effects related to the particular music into the creation of spatial compositions.

6. References

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