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Arquitectura; Arte; Comunicación; Diseño; Educación; Planeamiento y Medio Ambiente; Tecnología; Urbanismo; Visualización; Otras.

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Presentación de resúmenes (hasta 600 palabras)

Podrán ser escritos en español, portugués o inglés, en letra Arial 10. Además deberán indicar el área de interés, el abordaje de referencia y la categoría.

15 DE JULIO DE 2011

Confirmación de aceptación

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Translating Urban Environment to Music
A Proposal for an Augmented Perception of our Cities through their Music Imprint

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Abstract: *This paper presents a methodology to augment acoustically the experience of the urban environment by mapping its fundamental spatial elements and translating them to sound and music. The methodology can be applied at any given path of an urban network to generate its acoustical representation with sounds produced by appropriately chosen musical instruments. The objective is twofold. On the one hand it targets the amelioration of the urban experience of people with impaired vision while on the other it offers a more synaesthetic spatial perception to all those who rely mostly on their retinal understanding of the environment.*

Palabras clave: architecture; music; translation; spatial perception; urban experience.

Introduction

Music and architecture have always been regarded as creative processes in space and time, having a variety of common features and reciprocal values, with the single objective to make human life better. Looking back in the history of architecture one can find a plethora of musical references in the design process, either as design parameters, such as rhythm, analogies, repetition, metathesis and time values, or as direct translations of a musical score to architectural form. In both cases, the design targets the creation of spatial properties that would give architecture a distinctive experiential character. Examples of architectural buildings that are directly influenced by musical elements are the façade of the monastery *La Tourette* by Le Corbusier and Iannis Xenakis, the intervention at the historical center of Rieti in Italy by Valerio Casali, the *Biology Center for the J. W. Goethe University* in Frankfurt by Peter Eisenman as well as the *Jewish Museum* in Berlin by Daniel Libeskind.

The depiction of sound on the one hand and the music composition of an image on the other can be creatively expressed in a variety of ways. A city through its visual experience is different for every person. Is it possible then to devise a code that could translate not the actual image of the city but rather the personalized, cognitive one into sound? This proposal creates a new 'code of perception' of the permanent elements of the urban environment, leaving out all the secondary fast-changing stimuli that are difficult to be captured. The code is based on a proposed correlation of optical with acoustical stimuli and vise-versa.

Related work

Prior to examining a new methodology for a space-music data interchange it was deemed necessary to analyze selected case studies where classical music pieces where translated to three dimensional forms, as well as reverse processes where architectural elements where translated to sounds. They all demonstrate the parallel nature of musical continuity and spatial continuity in architecture.

Stretto House: Steven Holl designed *Stretto House* inspired by Béla Bartók's *Music for Strings, Percussion and Celeste*. The name of this private residence was derived from the musical term *stretto,* meaning the overlapping of musical themes, and represented the main synthetic tool of the design process, the overlapping of spaces. (Martin, 1994, pp. 55-59).

Bloch City: According to the principles of graphical notation, every traditional musical score has a graphical dimension, which can be considered as an emotional object. Such an idea of direct correspondence of a musical score to architectural space was examined by Peter Cook (Archigram), who transposed the graphical form of a concert for violin by Ernest Bloch to a plan of the ideal city. (Tsinikas, 2009, p. 53).

Yamato International Building: This office building by Hiroshi Hara is one of the few examples of architectural forms that were translated to music targeting that way the senses of sight and hearing in a single spatial experience. The translation was carried out at the *Key Station* of the TU Wien under the supervision of Prof. E. Simoncsics. The building was initially divided into successive layers (sections), which in turn were translated into sound with the use of a single musical instrument, that changes pitch according to the height of the elements of the section, resulting to a complete musical representation of the building.

The analysis of the aforementioned case studies concluded to four main methodological guidelines, which are important in the translation of any architectural setting to music:

(1) the use of layers that logically disseminate spatial characteristics,
(2) the identification and classification of spatial elements,
(3) the translation of height to musical tone, and
(4) the overall appreciation and embodiment of linearity in the translation process.

Methodology

Scientific findings in the domain of cognitive psychology reveal that people subconsciously create mental representations of their spatial surroundings, which are embodied in "mental maps", in order to be able to navigate themselves within the urban environment (Tversky, 1993, p. 1). Although personalized, these mental maps contain some important objective elements as well. According to Kevin Lynch, there are five objective elements that people relate with in their reading of the urban environment: paths, which are the most fundamental ones, edges, districts, nodes and landmarks (Lynch, 1960, pp. 46-49). In order to create an "acoustical" picture of the urban environment this methodology relies on Lynch's classification. Depending on the desired detail of the outcome, one can begin by researching the elements in the aforementioned list by Lynch and, moreover, add other standard sub-elements that exist upon urban paths. The translation of those elements into sound follows a syntax which is based on the correspondence of a "path" in the city to a score of the music notation. Three basic common characteristics are identified here:

- Firstly, both the music score and the path are experienced and perceived in a linear manner through time.
- Secondly, they are both intimately connected with the perception of the musical composition and the cityscape respectively.
- Thirdly, they are both linked with the subjective choices of the music performer and the city explorer.

As people move in the city, they become aware of different layers of spatial elements on both sides of their chosen path. This project focuses on the translation of the architectural elements upon the first layer, meaning the one people perceive most directly on both sides of their route. Based on Xenakis' UPIC system for the translation of graphic images to sound (Xenakis, 2001, pp. 190-192), a three-dimensional Cartesian system of axes was initially created to better map the urban elements and the movement of people:

- the X axis is the one mapping people's movement and direction,
- the Y axis is placed vertically on X showing the depth of the urban elements, while
- the Z axis extends along their height.

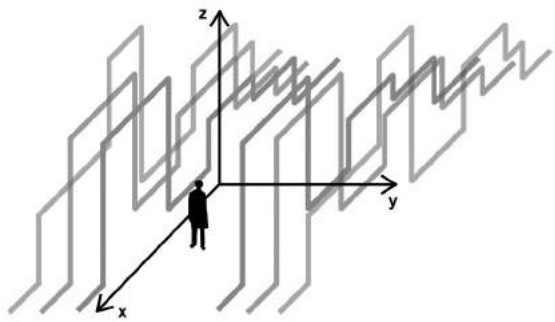

Fig. 1. The city and the human in the XYZ system of axes.

The next step was to correlate this XYZ system to basic musical characteristics. In this manner:

- the length of the elements on the X axis corresponds to the duration of the sound,

- the depth on the Y axis corresponds to the reverb, which helps the user create an approximate perception of depth, and
- the height on the Z axis corresponds to the tone of the sound.

Moreover, the particular way of how people move about relates to the expression, which means the subjective way of approaching the musical style. So it is desirable to provide people with the possibility to generate/create/reproduce their personal sounds. Finally, the importance of an architectural element is noted with the intensity of the sound that corresponds to it. The more important the urban element is, the more intense the corresponding sound will be.

Having set the "Cartesian" parameters of the translation, the methodology proceeds with the identification and classification of the basic characteristics of the urban environment. The importance of those urban elements in the acoustical depiction of the cityscape was further verified by Ioanna Maria Gkertsou, a collaborator with visual impairment. Her contribution is marked with the orange numbers in Fig. 2 stating those 12 elements that finally take part in the proposed translation process. In terms of music analogies, those 12 elements where additionally categorized based on their extension along the X axis, which is translated as "duration in time" and is used to specify the correspondence of different musical instruments to each one of them. Therefore, one finds long duration elements and short duration/ instantaneous elements. Furthermore, the selection of the musical instruments was heavily based on their familiarity with the average ear, having a discrete sound that could be easily distinguished even among a larger group of those. Clearly, the process of the acoustical representation of the urban elements is subjective (and) not based on objective criteria, so in an effort to make the translation as complete and coherent as possible, the use of additional characteristics is essential. Such are the special quality of the sound that each instrument produces and the emotions it generates to the listener. In conclusion, the proposed dictionary for translating the urban environment to music is as follows:

- *Building*: The basic urban component is represented by the basic musical instrument, the piano. As ground floor is defined the note C, as first floor the note D, as the first underground floor the note B etc.
- *Building openings*: They are represented by the saxophone, which produces either longer continuous sound for the translation of bigger open surface, or intense instantaneous sound for the translation of elements such as doors.
- *Gap (with or without use)*: Pause, meaning time of silence.
- *Sidewalk*: It constitutes a continuous and constant element. It is represented by the violin, which produces continuous and constant sound.
- *Street*: It also constitutes a continuous and constant element. It is represented by an instrument related to the violin, cello. Due to the fact that the sounds of lower frequency are more difficult to be perceived by the human ear, the street is represented by such a sound, because a slight reference to its presence, as a background sound, is needed.
- *Public transport stops*: They are represented in this translation by the drum. The sound of the drum is mainly characterized by the staccato musical mode, in which the notes are short in duration and not linked. The different types of stops will be performed by repeated percussions. For example:

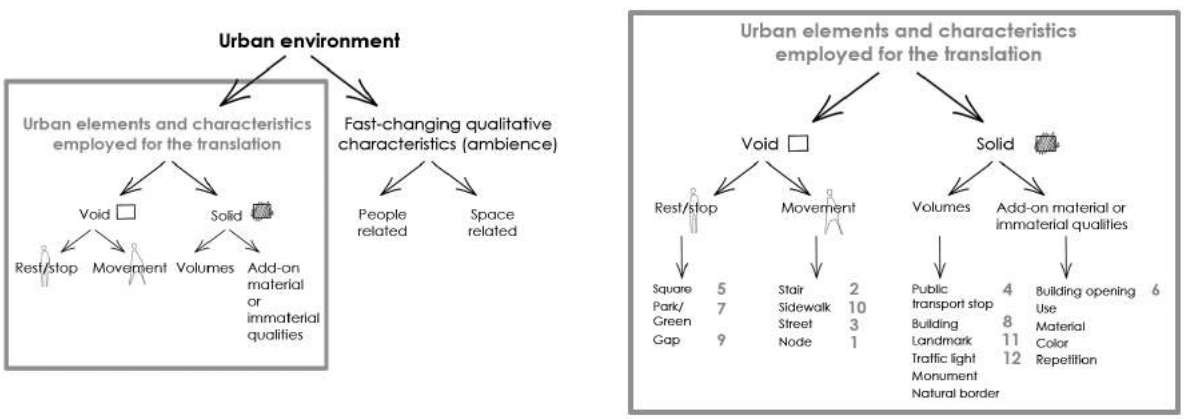

Fig. 2. Urban elements and characteristics.

Bus stop: 1 percussion, Metro stop: 2 percussions, Taxi stop: 3 percussions

- *Stairs*: They are represented by the sound of a trumpet, which has a marching tone and gives a sense of gradation either upwards or downwards.
- *Park/Green*: For its translation flute is used. The specific instrument produces a pleasant and trembling sound, which can describe better the free form of the trees.
- *Landmark*: It is translated by Maracas, which produce a discrete and instant sound.
- *Traffic lights*: They are represented by cymbals as they produce a discrete and instant sound, something that describes the small spatial extent of the traffic lights. In addition, the sound is intense in order to underline the fact that additional attention is required.
- *Square*: It is represented by harmonica, as it produces a constant sound to account for the stability in its form and simultaneously a playful sound, which represents the movement and the actions that take place in it.

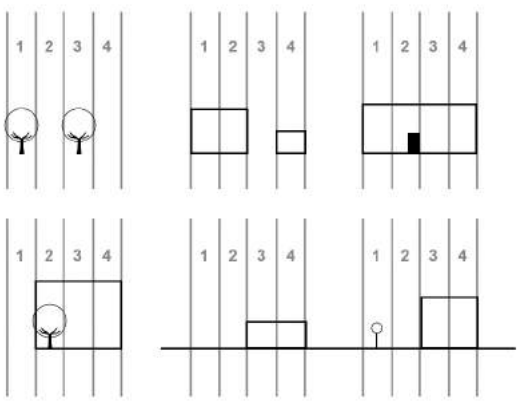

Fig. 3. An example of the translation process. The meter of the musical piece is defined by the elements of the façade of the street. Here we can see six musical pieces in 4/4 time.

The proposed methodology was tested in the city of Chania, upon the western street of 1866 Square. The results can be found online at http://www.youtube.com/watch?v=bEJmazn87cs.

Potential application

Ways to achieve an even larger scale implementation of this proposal, for the acoustical representation of a whole city, making use of the available technology could be discussed. One can easily imagine a more advanced form of today's GPS, the «AmplifiedGPS», which in addition to the visual representation of the whole path will also have a sound representation. In other words, all the possible paths in a city are acoustically stored in the "AmplifiedGPS" database, corresponding to the Google Earth map.

Furthermore, a potential application based on the methodology described in this paper should embody different modes of operation depending on the user's desire:
- Walking Mode: it is the simplest one to enhance the urban experience of a pedestrian.
- Touring Mode: it is the basic mode to be used when a relatively complete description of a path is desired.
- Detailed Mode: it additionally incorporates some secondary characteristics of the urban elements as well as some qualitative characteristics of the city.

Conclusions

The translation methodology does not claim to be neither exhaustive nor the only right one. However, it explicitly demonstrates that such a code is actually possible, potentially useful to everyone and rather easy to implement. Moreover, by encouraging multiple representations of the built environment augmented culture can become a reality that relishes more than one of the human senses. This is expected to help people with impaired vision in their everyday life, and in addition will offer everyone the "luxury" of a complete synesthetic perception of the urban environment.

Acknowledgements

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