Music as an Interventional Design Tool for Urban Designers

Stefan Petrovski
Dept. of Electronic and Computer Engineering
Technical University of Crete, Greece

Panos Parthenios
School of Architecture
Technical University of Crete, Greece

Aineias Oikonomou
School of Architecture
Technical University of Crete, Greece

Katerina Mania
Dept. of Electronic and Computer Engineering
Technical University of Crete

1. Methodology

At first look, music and architecture seem unrelated, but they share features such as composition, rhythm, repetition and analogies. Acoustic data encoded from the built environment provides a valuable platform on which discordant and imbalanced parts can be highlighted [Liapi et al. 2011]. The cognitive process of analyzing today's chaotic urban eco-system can be augmented with cross-modal understanding and intervening through the eco-system's musical footprint. Based on a grammar which connects musical with architectural elements, we present a system that offers sonification of an Urban Virtual Environment (UVE), simulating a real-world cityscape, offering visual interpretation and interactive modification of its soundscape (Figure 1).

The exciting methodology analyzed in this paper expands the hearing experience of the urban environment by marking its basic spatial elements and transforming them to sounds. Any given path of an urban setup can be marked in order to create its soundscape with sounds produced by selected musical instruments which blend in a harmonized manner. A 3D simulation of an urban environment is created including urban constructs fundamental for "reading". These are: buildings, paths, gaps, stairs etc. Every object category is translated to a different sound such as buildings

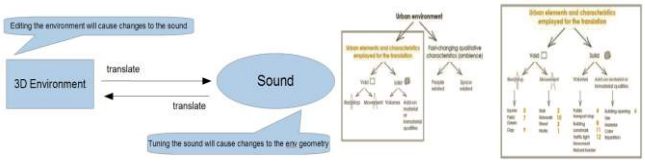

Figure 1. *The abstract view of the system*

represented by piano, openings by saxophone etc. Building blocks are provided by the system and external objects can be included. Once the environment is assembled, the user can choose an urban path to translate to sound. The path is then scanned from the starting to the ending edge and the sound representation of the objects on that path is saved in a MIDI (Musical Instrument Digital Interface) file. We propose an encoding-decoding mechanism between urban elements and notes, which employs music composition rules. We then apply a series of music composition rules in order to tune the acoustic result and eliminate discordant elements. The refined music notes are decoded back into urban elements. The resulting urban environment is a more balanced eco-system, viable and sustainable. *Cities can be tuned.* We provide tools to designers in preserving the eco-systems viability and originality. This methodology reveals patterns, not visible to the human eye, which can be analyzed and re-used to create new eco-systems.

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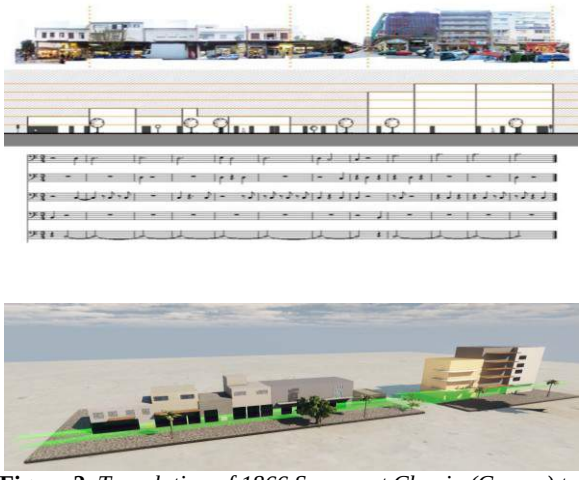

Figure 2. *Translation of 1866 Square at Chania (Greece) to music*

2. Implementation

We use the jMonkeyEngine (jME) game engine for the development of the interactive system (Figure 2). The system utilizes the MIDI protocol to communicate between the graphical representation of the urban environment (a facade of the street, square, etc is first transcribed to music score) and the acoustic output. The MIDI files provide us with an in-depth analysis of the characteristics of the generated sound, such as, the used note, note's pitch, velocity, channel number. We took advantage of Java's MIDI libraries for managing the sound-related tasks. The sound imprint of the selected objects in the VE is created by scanning the path in which they are found. As the scanning progresses, the notes and sound parameters that represent the path's architectural elements are written as MIDI messages in a MIDI file. Then, the file is opened in a MIDI editor for modifying with the architectural impact on the scanned path being visible in real time. The translating method is successful only when the inner relations of the urban eco-system are preserved and highlighted in the music eco-system. The interface of the digital mediator is crucial in order for the process to be as seamless as possible. We see great potential for using the translation method as a composition tool in urban design through which our chaotic urban environment could be tuned. People with impaired vision can be offered improved urban experience, while, individuals who rely mostly on their visual perception of the environment are offered a more synesthetic spatial sensitivity.

LIAPI M., PARTHENIOS P., TOMARA A. 2011. Translating Urban Environment to Music: A Proposal for an Augmented Perception of our Cities through their Music Imprint. *XV SIGraDi Augmented Culture, Argentina, 16-18*