Adopting a cross disciplinary approach to propose a new design tool for discovering urban design discordances

by Panagiotis Parthenios *

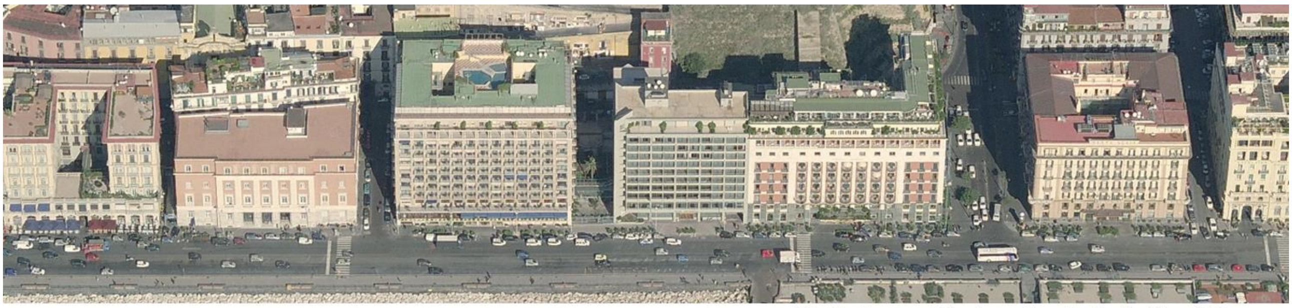
Introduction

Contemporary cities are live mechanisms, eco-systems, which perform under certain rules often not visible to the human eye at first sight. An urban designer needs advanced analytical tools in order to understand the inner-relations that describe these eco-systems. We are currently investigating whether Zipf's Law, which was successfully transferred from literature to music, can also be applied to urban design. Our hypothesis is that if we take a series of facades from different neighborhoods and we analyze the characteristic elements of urban design that constitute these parts of each neighborhood, we will verify that Zipf's Law is valid since the frequency of any element should be inversely proportional to its rank in the frequency table. The possible existing instances which do not comply with the rule should be an indicator for the urban designer to intervene.

Comparing data from two streets in Naples

Taking the idea of using music as an interventional design tool for urban designer a step further, we have applied the proposed translation mechanism into a selection of different street facades of Naples, Italy. The proposed encoding-decoding mechanism for tuning our urban eco-system is tested in Naples' neighborhoods in order to calibrate the system and discover potential new elements which need to be added to the translation mechanism. In figure 1 one can see two very different sets of neighborhoods from the center of the same city, Naples, which have been selected for testing the translation mechanism. Via Partenope is constituted of long and tall buildings with strict and canonical façade layouts, most of them having a distinct base and top part with a multi-floor body of repetitive modular elements (windows or balconies). Via Salvator Rosa on the other hand, is comprised of shorter (in length and in height) buildings which do not follow a strict order, appearing to carry alterations in the micro-scale. A sense of richer compositional syntax is conveyed when listening to Via Salvator Rosa's music output, despite the individualistic approach of each entity. This feeling is amplified when listening to the "irregular" tonal spaces between each building due to the slope of the street but also the differentiation in total height. Buildings in Via Partenope produce a more regular rhythm due to the repetitive structure of their facades, without major "irregularities" in the transitions between buildings, but higher in pitch than in Via Salvator Rosa.

Arnold Schoenberg argues that the establishment of a musical form entails two fundamental principles: repetition (of pleasant stimuli) and variation (of new stimulus, of change), as noticed in Via Partenope and Via Salvator Rosa respectively. The application of Zipf's Law in music initially by Boroda and Manaris and later by Simon predicts that a system of interacting agents tends to find a global optimum that minimizes overall effort. Furthermore, H. Simon managed to show a stronger correlation between the process of text generation and music composition. He also tried to demonstrate how context is shaped in language with words and in music with notes. Our hypothesis is that Zipf's law could be further applied to the acoustic data produced from the translation of the built environment in order to "tune" the outcome and produce a more balanced system of urban elements. Acoustic data encoded from the built environment provides a valuable platform on which discordant entities can be more easily identified and also imbalanced parts get highlighted. The cognitive process of analyzing today's chaotic urban eco-system can be augmented with a new dimension of understanding but also intervening through its musical footprint.



Via Partenope, Naples - Google Earth Street View

Via Partenope, Naples - Google Earth Street View

Via Salvator Rosa, Naples - Bing 3D Bird's Eye View

Via Salvator Rosa, Naples - Google Earth Street View

Figure 1– Data from two streets in Naples, Italy

Alternative Methodologies

Zipf's Law requires a significant corpus of data in order to be verified. Since acquiring -but most importantly also decoding- such a large set of façade photos is very hard we are examining two other methodologies:

a) use of computer vision algorithms (image processing and recognition) for data acquired through Google Earth Street View combined with Bird's Eye View in Bing Maps 3D. For example StreetScore (http://streetscore.media.mit.edu), developed my MIT's Media Lab, measures perceived street safety using a machine-learning algorithm. The computer is continuously being trained by online user participation –along the notion of crowdsourcing. Simple users who visit http://pulse.media.mit.edu vote on quality characteristics of urban neighborhoods presented in pairs of photos from Google Street View.

b) use of Amazon Mechanical Turk (https://www.mturk.com), a crowdsourcing internet marketplace for tasks that computers are unable to perform yet and the use of human intelligence is still necessary. For example Lev Manovich of CUNY's Graduate Research Center and his team randomly selected 120,000 photos from Instagram from different cities and used Mechanical Turk to review and evaluate them in order first to decide whether they were self-portraits (selfies) and then to estimate the gender and age of the subject in the photograph. At the end, using automatic face analysis algorithms they evaluated the subject's emotional expressions based on mouth, noise and eye positions. Scope of the project is to investigate the style of self-portraits in five cities across the world and present the findings about the demographics of those taking the photos according to their city (http://selfiecity.net)

Music patterns

While investigating the possibility of Zipf's Law being applied to urban design in the scale of neighborhoods through their translation to music, we discovered the emergence of music patterns. Early results show that there are common music patterns of translated neighborhood facades between significantly different neighborhoods of different cities, which suggest a deeper inner relation not so much in a quantitative level as in a more conceptual, qualitative, perhaps even emotional level of spatial perception. Compared urban sections share common characteristics in terms of tonality, rhythm or pauses revealing types of urban soundscapes which function independently from their geometrical values or the typical architectural vocabulary. Emerged similarities urge for further research in order to investigate whether the seemingly divergent parts of a city or separate cities share tangible common qualities which are able to affect the values that determine the livability of a contemporary urban environment.

Notes

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