Title: The Rhythm of City

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Abstract

The growing amount of user-generated data is a sign for the society's dependence on digital networks. Not surprisingly the rapid development of technology is mirrored as well in arts. The virtual environment is an inspiration and as well a working medium for many creative people.

The aim of the paper is to introduce a different approach for the interpretation and usage of geo-located social data. To be more precise, the art project described here can be categories as a real-time and mixed reality art piece. We are proposing an innovative and artistic way for applying geo-located social data for describing a city's pace of life. Our concerns are about the malleability of the digital world to the physical one, and the interpretation of social data for artistic purposes.

The goal is to metaphorically describe locations by extracting geo-tagged content and translating it into the rhythm of a physical metronome in real time. In short, a metronome represents a city. The installation consists of 10 modified metronomes whose rhythms correspond to the selected cities' digital pace of life. The audience is given a chance to discover and experience an alternative way of perceiving different locations through a continuous performance of 10 metronomes.

To put in a nutshell, *The Rhythm of City* is an art installation that explains in original way digital geo-located social content and characterizes cities. Even more, the work is an ongoing performance that embraces different locations, digital social data, and physical kinetic motion.

Introduction

Starting with the inspiration for the project, Bornstein & Bornstein discovered a positive correlation between the walking speed of pedestrians and the size of the city [18]. Robert Levine [12] demonstrated the faster pace of life in the northern, economically developed and individualistic countries in his study. In short, the investigations proved that it is possible to describe a city and its culture by the speed of inhabitants and services, and its location.

Consequently, we assume that the digital geo-located social data can give us similar results: in economically developed countries bigger cities generate more digital social content rather than the cities of undeveloped countries. In other words, we believe that the analyses of geo-located social data will give similar results as have achieved Bornstein & Bornstein and Robert Levine. Thus, the aim is to artistically relate to these studies.

Our assumption is based on numerous facts and theories. First of all, the society is going through the digital revolution and we are living in the information age. Our statement is supported by many theories and studies. For example, William J. Mitchell argues in his book *Me++*: "*disconnection would be amputation. I am part of the networks, and the networks are part of me. I show up in directories. I am visible to Google. I link therefore, I am* " (page 62) [14]. Besides Google Twitter, Flicker, Facebook, etc are part of our every day's life.

To be more specific, Fujisaka, Lee, and Sumiya state in their article that a significant part of population is sharing its daily live and social events through microblogs, like Twitter. Even more, the growing usage of mobile devices makes blogging more popular and accessible. It means people are reporting about happenings, their activities, feelings, etc instantly [8]. The authors refer as well to the fact that it is possible to make sense of the data of microblogs. Although the messages on Twitter are short and have limited information, many researchers are looking for a set of mass movement that allow to *discover interesting and useful patterns such as social/natural events or social customs/culture* [8]. All this is possible because of a location and a time-stamp that are involved into many posts in social networks.

For instance, Singh, Gao, and Jain are applying *spatio-temporal-thematic data* for generating *social images*. It means the regions with higher activity level concerning *swine-flu*, for example, will have more intensive pixel values on the images generated by the program [9].

Drawing on these facts, a city's culture and pace of life can be observed by geo-located social data. There are a growing amount of studies on making sense of the location specific digital data, like instant posts on microblogs. Therefore, it is inspiriting for us as artists to apply this phenomenon for performative and artistic means. The following paragraphs of the paper are dedicated to the concept and the realization of the art project. The related artworks are introduced as well. Moreover, it is aimed to position the art piece within the art disciplines and discus related artworks.

CONCEPT

The Rhythm of City has multiple layers of concept. First of all, geo-located data are translated into the mechanical rhythm of a metronome. The same rhythm represents a city's pace of life. We believe that people's activity in the social networks can be applied for describing a location's culture and living rhythm.

Second, there is a twist from digital to physical. The digital data are translated into physical kinetic motion and mechanical sound. Thus, the meaning of information has been altered and applied for totally different purposes. To be more precise, the same has happened with a metronome – the device has been given totally new and unexpected function from its' original one.

And finally, the users of geo-located services are influencing the rhythm of a metronome in real time. In other words, the online audience of selected locations is a part of physical installation.

It constitutes that *The Rhythm of City* is an installation that can be viewed as an *open* performance [7], which score is based on geo-located data. Even more, online users of the selected social networks are influencing the score in real-time. Or to put other way round, the art piece is a real-time artwork as suggests Jeffrey Crouse in his master thesis [5]. He states that this kind of genre of art comprises two distinct parts: the information source(s) and the work it self. The art piece on its own gives a new frame for the data source, and at the same time, alters the meaning of it. Hence, the information does not stand for the information anymore, but for something totally different. In the case of *The Rhythm of City* the geo-located information of sources are transformed into a rhythm of a metronome in real time. On the other hand, The *Rhythm of City* can be seen as mixed reality installation cause it crosses and blurs the borders of virtual and physical. Taking into account both theories, we propose to categorize the artwork as a real-time mixed reality art piece.

What is more, the artwork goes beyond a sonic installation. It can be viewed as a representation of a city's rhythm or a its' pace of life. In other words, the rhythm of a metronome is an interface of a city. Through observation one is able to make a conclusion on the tempo in certain city and compare different locations between each other. Hence, the installation can be perceived as a performance by 10 metronomes representing different cities but also one is able to observe a single metronome and listen to a specific city, if it is wished so (Figure 1.).
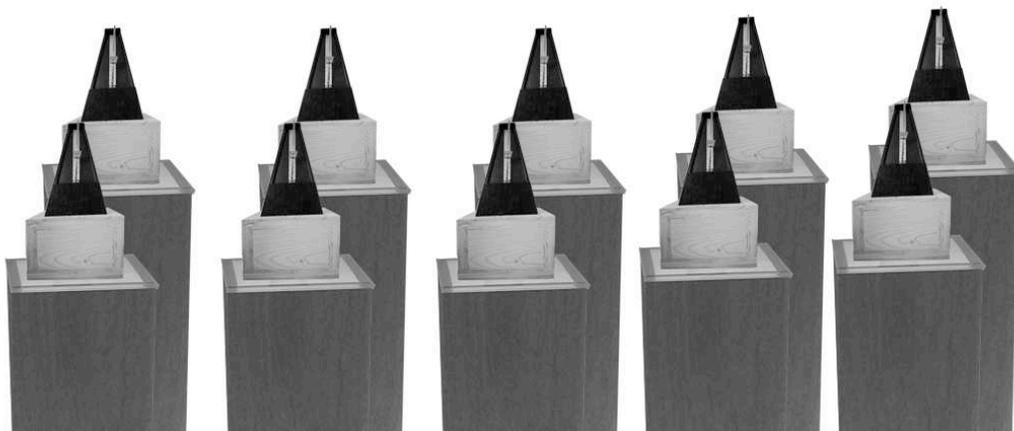

Figure 1. The sketch of installation's set-up

The installation is a sonic and at the same time visual interface for perceiving the urban life and culture of different locations. Moreover, we would like to give an alternative meaning and purpose to the location-specific invisible online data. In short, the artwork makes invisible information visible and audible.

We have chosen metronome as a performing tool and representative of a city because of its ability to produce different rhythms and its' unique nature of functionality. It should be underlined that *The Rhythm of City* is not a typical work of data visualization. On the contrary, we are approaching globalization and cities' life from an artistic point of view and creating an experience out of it. *The Rhythm of City* always offers a unique experience to its audience cause it is driven by unpredictable digital data that are generated by online users in real-time. According to the fact that the artwork is a unique experience for viewers, the statement of Walter Benjamin concerning aura-less artworks in the age of mechanical reproduction [2] does not have a ground. We are drawing on the article by Botler et al. that questions the aura of mixed reality works, the art pieces that are between the virtual and physical world. *And therefore exist at the boundary between reproduction technologies and older forms, to which Benjamin ascribed aura* [3]. The authors suggest that mixed reality works re-gain aura in a new [4].

When it comes to the reason for using metronomes, in 1962 György Ligeti composed *Poème Symphonique for 100 metronomes*. 100 metronomes performed the piece and each of them was set in a different speed [15]. Accordingly, current art installation can be viewed as a musical piece as well. But what is more important, the rhythm of certain metronome will be controlled by the social data of certain city by its' inhabitants. And thus, has its own meaning. We believe that *The Rhythm of City* is an original artwork in terms of visual and audible experience for the audience.

REALIZATION

In order to achieve the most accurate rhythms of cities, multiple social networks as the sources of social data are used. To be more specific, according to the selected cities the recent geo-located social data from Twitter, Flickr, and Youtube are retrieved every minute. Thus, for each location the score is composed periodically.

The score is a combination of recent social activities in the three social networks. The location-based trends of social sites are gained from *Alexa.com*, the web information company [1]. This institution presents a trend list of online services sorted by countries.

In short, the software robot of *The Rhythm of City* gets the number of posts from the social platforms in the last minute and converts them into the rhythm of a city taken into consideration the proportion of each social network. All this is repeated every minute (see Figure 2. for more details).
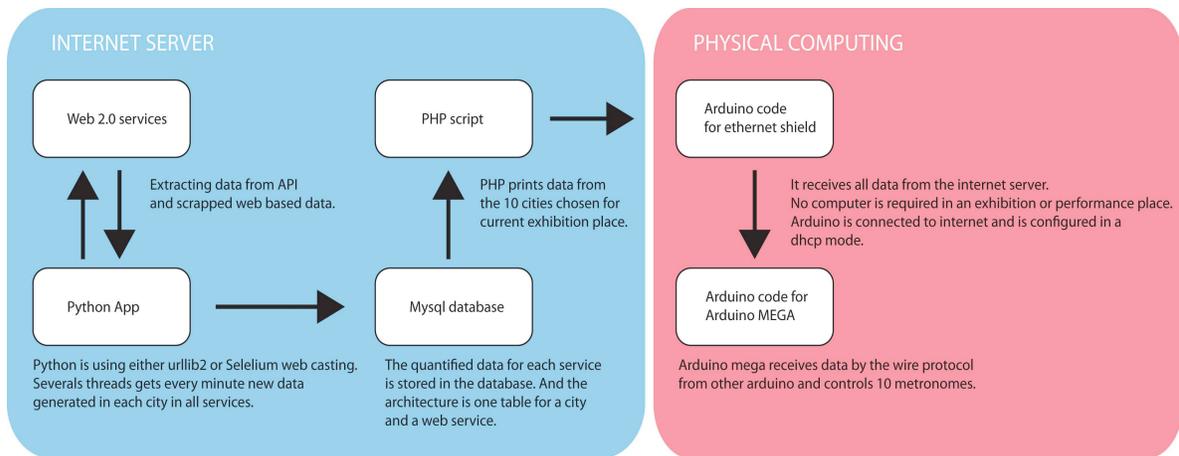
Figure 2. The architecture of "The Rhythm of City" software realization

Explaining the dedicated software of the artwork, the desktop application was developed in Python. The specific programming language was chosen because Python is an optimal solution for creating *web crawlers*. *Web crawlers* is a software-based search robot, known as well as web-spider that analyses web according to the target [16]. In this case, *web crawlers* is looking for the social data appeared in the last minute on selected social services and afterwards counts the new input. The query of search robot is location specific. It means the program is looking for the new social data only in the declared cities.

The database was created in MySql for storing the information gained from *web crawlers*. All location specific values that are used for generating the rhythm of each metronome are placed into the database. The script written in PHP extracts the values of rhythms for each city from the database and prints to the dedicated web page.

Continuing with physical part of the project, it consists of modified metronomes and microcontrollers. Arduino (microcontroller) with an Ethernet shield is connected to Internet in order to obtain the scores of the metronomes every minute. The score from 0-255 is translated to the different rhythms by Arduino Mega (the second microcontroller) and forwarded to the servomotors.

The metronomes displayed in the installation had been modified: inside each of them is placed a servomotor that is realizing the tempo of metronome forwarded by the microcontroller Arduino Mega (Figure 3).
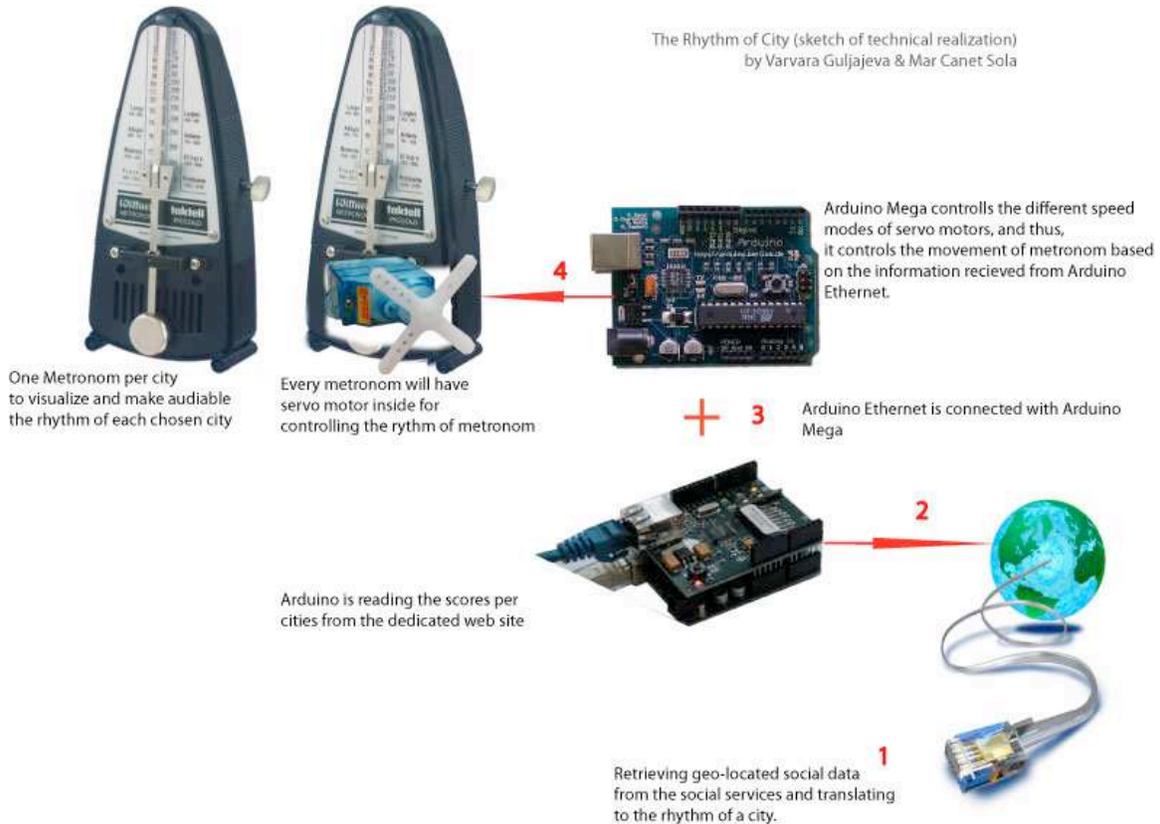
The Rhythm of City (sketch of technical realization)
by Varvara Guljajeva & Mar Canet Sola

One Metronom per city to visualize and make audiable the rhythm of each chosen city

Every metronom will have servo motor inside for controlling the rythm of metronom

Arduino Mega controlls the different speed modes of servo motors, and thus, it controls the movement of metronom based on the information recieved from Arduino Ethernet.

Arduino Ethernet is connected with Arduino Mega

Arduino is reading the scores per cities from the dedicated web site

Retrieving geo-located social data from the social services and translating to the rhythm of a city.

Figure 3. Technical realization

Limitations and reasons for applying certain social networks

Twitter, Flickr, and Youtube were selected for extracting social data for several reasons. First of all, these social services are widely used all over the world [1] and have been applied for describing epidemics and other social events in several studies [8, 9]. Therefore, the score that is a proportional combination of users' activity within these social networks is reliable and realistic for representing the rhythms of cities. Moreover, the project is one of the few ones that apply a combination of data sources and evaluate their importance. Normally just one source, for example Twitter, is applied for extracting and translating social data.

The second reason for selected specific social application was available search by a city. For example, Google provides the geo-located search by country only. It means one is not able to look for the geo-located posts by a city [7]. Only solution would have been to search for the posts concerning certain locations or look for data by a country. However this solution did not serve our needs exactly. Thus, Google as a data source was rejected. Opposite to Google Twitter, Youtube, and Flickr support search by city in real time and therefore were applied in the project. However, it is possible to expand the number of used social networks, and thus, make the rhythms of places even more accurate. For example, Wikipedia could be considered as an additional source for score calculation.

Concerning further limitation, it is important to point out that certain social networks are banned in some countries. For example, Youtube, Twitter, Facebook, Google and some more web sites are blocked in China [17]. It constitutes that it will be difficult to include any Chinese city to the installation.

Related works

The explosion of web technology and digital culture continue to be an inspiration for many artists. Moreover, virtual environment is applied as an artistic medium often. For example, *TheSheepMarket.com* by Aaron Kobin is a *collection of 10,000 sheep made by workers on Amazon's Mechanical Turk* [11]. This artwork becomes a mixed reality work once the collection is printed. However, this project cannot be viewed as a real-time art because there is no in- or out-put of real time data.

Introducing some examples of mixed-reality and real-time art, Julian Popp has done significant art pieces in this area. For instance, *Bit.Fall* is an installation that displays the most popular keywords of current online news. The words, extracted from online sources, can be read only for some seconds while the water drops are falling. In this way the artist draws a metaphorical parallel with the instant and rapidly changing virtual world. Surprisingly in this work the water has an information carrier role. Julian Popp is strongly influenced by modern culture, and thus, lots of his artworks, like as well *Bit. Code*, are drawing on data and cyber culture [13].

An art piece from 2003 by Jonah Brucher-Cohen called *PoliceState*, is another perfect example for applying digital data as a concept and a medium that affects physical matter in real-time. In this case, *PoliceState* points out the fact that certain governmental organizations, like FBI, are snooping users on Internet (emails, posts on blogs, instant messenger, etc). The artist has developed a software script that makes use of the data being "snooped" by the authorities and turns it into the radio signals that control the toy police cars. *Thus the police become puppets of their own surveillance. This signifies a reversal of the control of information appropriated by police by using the same information to control them* [4].

Introducing one more related artwork, *eCLOUD* by Aaron Kobin, Nik Fafermaas, and Dan Goods is an installation in public space that uses the data of online weather forecast for creating a behavior of the artwork in real-time. *eCLOUD* consists of multiple liquid crystals, which are turned on or off based on the weather. It constitutes, the artwork has a behavior and reaction on the environmental conditions [6].

In the end, we would like to draw attention to the fact that the art world is concerned about and strongly influence by digital culture. Even more, artists are eager to bring virtual events into the physical world and use digital data as a medium for the artistic work. Moreover, there are already several terms, like real-time art, data sculpturing, mixed reality art that aim to describe this kind of art.

Conclusion

To sum up, *The Rhythm of City* is an inter-disciplinary artwork that challenges art theories and contributes to a new emerging art genres, like real-time and mixed reality art. But what is more important, the artwork introduces a unique experience to its audience. Suddenly it is possible to see and hear the cities' pace of life that is performed by mechanical metronomes. The score is unpredictable and never repeated cause it is composed by the online users of social networks in real-time.

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