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DI TORINO**

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DISEGNO & CITTÀ DRAWING & CITY

Cultura, Arte, Scienza, Informazione
Culture, Art, Science, Information

A CURA DI
ANNA MAROTTA
GIUSEPPA NOVELLO

GANGEMI  EDITORE

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THIS CONTRIBUTION IS A PART OF AN EXPERIENCES AIMED TO ANALYZE DIFFERENT URBAN CONTEXT, WITH DIFFERENT FORMAL CHARACTERISTICS, AND, WITH PHOTOGRAMMETRY METHODOLOGY OF DATA ACQUISITION, OBTAIN PRODUCTS THAT CAN BE COMPARED WITH EACH OTHER. THE CITY OF SAMARA (FED. RUSSIAN) IS ONE OF THOSE THAT PRESENTS MORE COMPLEXITY BOTH FROM THE FORMAL POINT OF VIEW AND FROM THAT OF ACQUISITION. IN THIS PAPER IS SHOWN SOME OF THE WORK STILL UNDERWAY ON A PORTION OF THE HISTORICAL CENTER OF SAMARA, FROM THE ANALYSIS OF THE INNER BLOCKS TILL THE STUDY OF THE URBAN ASPECTS OF THE MAIN STREETS, TRYING TO DEFINE SURVEY METHODOLOGY FOR THE CONSERVATION OF THE IMAGE OF THE CITY.

KEYWORDS: SFM SURVEY, REALITY BASED SURVEY, URBAN FRONTS, SCHEDULES

History of the old town

Samara was founded in 1586 under the command of Tsar Fëdor I to protect, with the construction of a fortress in the confluence between the rivers Volga and Samara, the Russian borders from forays of nomads and to ensure navigability from Kazan to Astrakhan. Samara acquired the title of city in 1688 and began to serve as a military base and major trade center with the East. On December 6th 1850, Tsar Nicholas I issued a decree for the establishment of the province of Samara. In this period the city consisted of a population of 15,000 inhabitants, and in 1916 reached 150 000. In this period the province of Samara became one of the most important commercial centers of the Russian Empire, in particular for products such as wheat, wool, skins and cattle. In the second half of the nineteenth century the brick buildings began to occupy more and more of the city center, confining the wooden architecture to more remote areas and creating a strong contrast. The great development of the early XX century led to an enrichment of the Samara's bourgeoisie who turned their tastes from the traditional Russian style to art nouveau. The main streets of the city were quickly reshaped with new style buildings. At the beginning of World War I, however, this predilection to art nouveau underwent a rapid shutdown and was followed by a rediscovery of classicism.

From January 1935 to January 1991 the city was renamed Kuibyshev, in honor of Bolshevik leader Valerian Kuybyshev. During World War II, between 1941 and 1943, the city was chosen to be the capital of the Soviet Union should Moscow fall to the invasion of the German troops. During this period a bunker for Stalin was built but never used. A great tragedy in terms of architecture was the loss of a dozen churches and cathedrals during the Soviet period, leaving only two of them standing nowadays. A new type of building was designed, the dwelling unit for workers. Starting from 1927 the new quarters were designed using new models and using a new approach. In agreement with the industrial development program and five-year plans, Samara played a crucial role in the economy of the region of the Mid-Volga. New architectural complexes were built without violating the current structure of the city, laid out in quarters around courtyards and the

churches were replaced with clubs for workers and kitchen-factories. Samara's architecture of this period is characterized by an innovative use of reinforced concrete and steel structures. The architecture was simple, functional but with a reference to the forms and classical symmetry typical of Stalinist architecture. The apartments of the Soviet period form the majority of the city's building stock. After the war, Kuibyshev became the largest industrial and cultural center of the Soviet Union, in particular for the aerospace, building, metallurgy, oil refining and light industry. The city also witnessed a rapid development of the defense that led to a very closed city. In 1979 the city's population reaches 1.2 million people. In 1986, the city reached its maximum population - 1.267 million people.

Given the importance of the industrial sector, the factories were and still remain an important element of urban development, greatly influencing the planning of the city. The preparation for the First World War, the Soviet period and the Patriotic War of 1941-1945 further contributed to the growth of the city, but this led to a crisis during the period between 1980 and 1990 due to the conversion of the military industry. The result of the conversion was the bankruptcy of many large enterprises.

This led to unemployment and an economic slowdown that had a negative impact on the demographic situation and the quality of infrastructure. Since the 80s onwards a period of speculation began during which the historic quarter was considered as an empty ground good for investment, significantly reducing the list of monuments and, in particular, crossing out from it the typical wooden houses. This led to the demolition of many areas characterized by typical architecture, and to the deterioration and abandonment of those left standing. In January 1991, the historical name of Samara was given back to the city. The economic crisis that began in the Soviet period peaked in 1998 with the collapse of the last enterprises that had failed to switch to a civil production. Since 2000 Samara has become a great center of development for the construction industry. Unfortunately, urban development has led to vast violations in the architectural style of the city by not following a general strategy. However, despite the losses of the conversion process, the city retains its leading position in the region, especially thanks to the oil and petrochemical industries. The modern city is one of the largest industrial and cultural centers of Russia, with a multi-ethnic population.

Blocks structure

In 1782 the first general plan for the city was approved, which determined the standard dimension of 250 × 125 meters for the quarters of the city. The longer side of the quarters were disposed parallel to the Volga and the shorter sides formed steep descents to the river.

This system led to a characterization of the urban grid through the presence of *courtyards*. They were divided in two forms: urbanized brick houses around the outside of the block and a free settlement (*sloboda*) with wooden houses and household buildings within. Towards the end of 1800 however, the houses built along these lines were almost completely replaced with new brick buildings.



After the October Revolution, life within the courtyards of Samara was subject to significant change. The owners had their rights severely restricted. Those who remained in the city were forced to move into smaller homes and flats, or moved to occupy one of the rooms of their old apartments, now converted into communal properties. During the industrialization of the 1930s and the Great Patriotic War of 1941-1945 the city was filled with migrants from villages and evacuees. Many institutions were transferred to Samara. The population underwent a significant increase and the houses were not sufficient. The new arrivals were lodged into already full houses, transforming the structure of the courtyards, which began to cluster small buildings and shacks. The relevant problem of the historical center of Samara lies in the total abandonment of the interior spaces in these blocks: walking along the main streets it is very frequent to find, along at least one of the four urban fronts of a considerable stylistic value, a access to an inner space. The clear distinction of the public and the private space is completely canceled. We rely on our perception to understand the formal and the social distinction of these spaces. And our perception tell us that the street and the courtyards are two different things inside the city, and the limit that separates them is represented on the screen of the buildings facades.

Analysis of Urban Facades

The study of the city of Samara conducted, in recent years, to involved the analysis of the urban front and its context. This interest is

part of a larger project, which involves Italian and Russian Universities, and a research project within the PhD School in *Survey and Representation of the Architecture*, who intends to analyze and compare different case studies of urban landscape and methodology approach to the detection and representation of the same.¹ The analysis of the city facades is one of the most consolidated topic of the urban landscape design: the facade is the most prominent element of the building and, for this reason, establishes the general character and a common image of the city.²

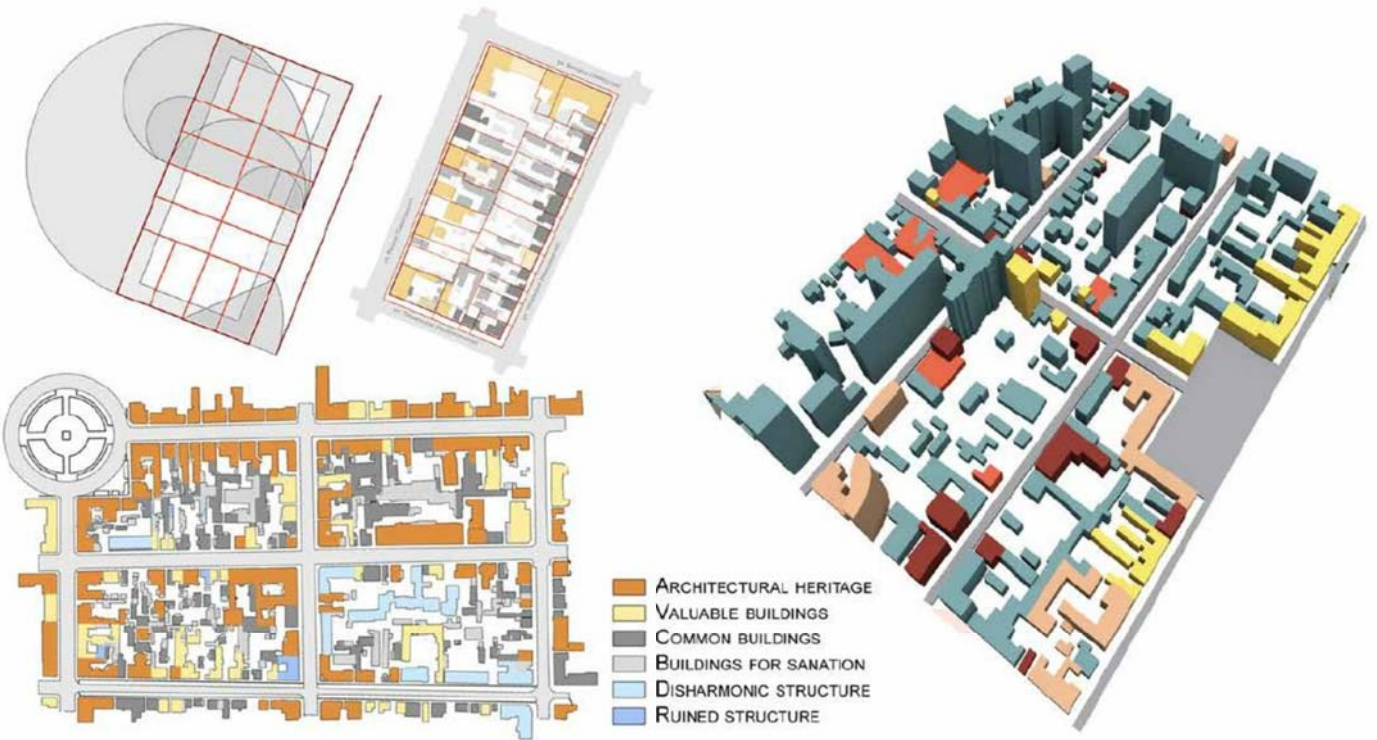
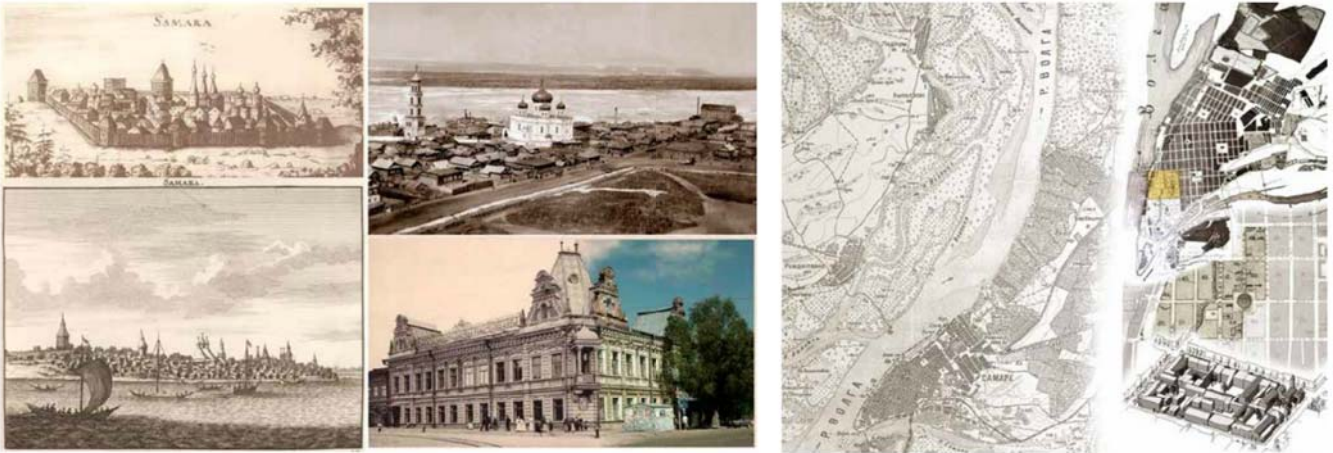
The facades of Samara city center not always are the transposition of the interior space of the apartments to the outside. Most of the time they are rebuilt separate to the building structure, and sometimes they expose an architectural style and materials utilization different from the function of the building itself.

In other cases, only the portion of the front facing the street is destroyed and rebuilt, according to the needs of the customer or of the public for the new function of the building. In any case, the variety of styles available, ranging from *art nouveau* to significant examples of *Soviet* architecture, through the traditional *wooden houses*, give to Samara a quite unique image. To define the plurality of the aspects of the city and understand the quality of this public space in order to describe and preserve it, it has been necessary planning a deeper analysis of these systems. The study started from the understanding of the components of the public space till the smaller elements of which the front is composed. To understand and repre-

2/ Some images of the old City of Samara. From the top: Samara in 1636, in XVIII century, in a picture of the beginning on XX century. Below: comparison between the old (1906) and the new (2008) image of Samara in a postcard.

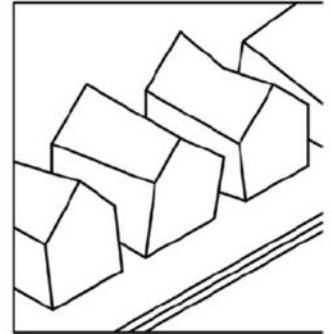
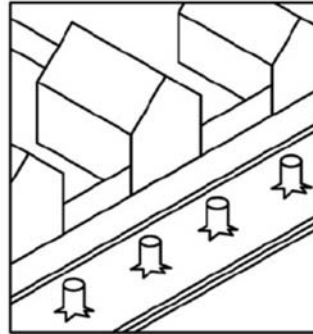
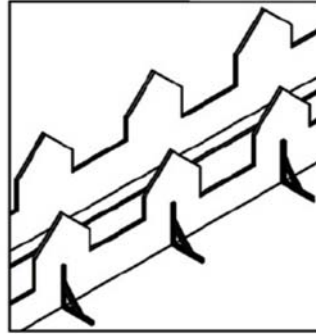
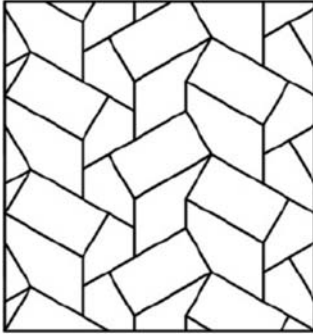
3/ Historical map of Samara in 1927, in which it is possible to see the situation of the opposite waterfront before the urbanization. On the right an historical map of Samara city center in 1910. The area of analysis is concentrated around the Lenin Square. It includes 10 blocks arranged in a regular grid. The blocks have a complex internal structure that present a lots of decay buildings.

4/ Morphology of ideal block in Samara: Counter yard 15x30 fathom comparing with existing situation of a block in the city center. Below: situation of a case study area. Four blocks analyzed with functional division of the building. On the right 3D model of four block in the city center: in pink color the administrative buildings, in brown social buildings, in blue residential buildings and yellow mixed-functional buildings. The model show the disposition of the new residential structure in relation to the lower wooden traditional architecture.



5/ The main problems of the blocks are related to the aspect of each building that has the facade in front of the street. They are, most of the time, fake facades, and they don't correspond to the inner building. Inside each block there are situations of chaotic housing, abandoned buildings and, sometimes, a low quality of urban design that create a lots of confusion to find an identity to Samara city center.

6/ Two aspects of the same City: Traditional wooden houses and Classical fake facade of two buildings of the same block.



sent the complexity of the area of intervention first had to be broken down into levels of investigation. These levels, including both the formal structure of the place and the set of specific descriptive features of each subset, are defined through the structuring of a drawing capable of describing the sphere of interest that generated them.³ After an initial evaluation of the general understanding of the place, has been planned the organization of data acquisition activities. For the planning of this step was decisive the choice of instrument, bound by the opportunity to acquire a large amount of data in few time. In order to get a product that contains much information as possible, regarding the description of the actual conservation of the front building and its context, the work involved the creation of three-dimensional models highly specific and descriptive. These models, obtained by a sequence of pictures made from different position, contain information about the shape and the texture of

each object, and provide an excellent reliability in geometric and materic aspect.

Photography and representation have always been closely related: photography is considering the most accurate way to recording of the aspects of the real world, and graphic representation as necessary to analyze and synthesize the surroundings.

With *structure from motion* methodology it is possible to cross both these techniques in order to create a model of the object and digitally recreate the environment that is around it. This approach create a new way to synthesize the context and the building: each element must be break up in order to identify the characteristic features and acquire them individually to increase the level of detail and precision.

The choice of an instrument taking advantage of *image based*, acquisition methods, able to develop a three-dimensional model closely corresponding to reality from a photographic sequence,

7/ The urban street furniture. Analysis of all the elements of the street: light poles, car parking, trees, bench, traffic signs. This allow to understand how many elements needed to be acquired by themselves, if they are elements integrated to the fronts, isolated elements or obstacles to the visibility of the front.

8/ Environmental transversal section of the area that show the variety of architectural styles present today in the historic city center. The sketches try to represent with watercolor technique the image of the city, the quality of the architecture and of the urban space.



in some ways constrained the organization of the phase during which the data acquired was broken down and managed.⁴ All the fronts of the street have been analyzed according to the camera acquisition movement. the first acquisition campaign focused on the overall appearance of the street front and elements of the spatial context. So the acquisition is keeping along the axis parallel to the front road, including cars, trees, benches and other street furniture elements that sometimes occlude part of the front of the building. To detect completely the front was performed additional campaign on individual buildings that would allow to integrate the previous product with a later complete and metrically accurate model. To get this, the operator approach to the object trying to decompose the forms and obtain first a general model of the single facade, then an accurate model of all its components. The camera has been calibrated with different focal lenses to get to describe distant elements. Some portions, however, necessarily remain occluded by the presence of terraces or protruding elements re-

spect to the front surface. In order to get an accurate description of the street acquisition phase is then related to every single item of street furniture.

Conclusions

The product thus generated, describing on the one hand the fronts of each building, and on the other the pieces of furniture, made it possible to obtain a model in which all the complexities at various levels of investigation of the entire area, were repurposed spatially, and the relations between the spatial elements and color tones of the scene represented.⁵

Thanks to the development of photogrammetric software the relationship between the real scene and photographic image seems to seek a renewed confrontation: the space of representation becomes virtually three-dimensional, and the photograph is modelled in this space, describing each surface, to make it as similar as possible to the reality perceived.⁶

9/ The analysis of the context for the planning of the photogrammetric survey activities. Division of the street fronts of each block and study of the elements present in the urban landscape.

IDENTIFICATION OF THE BUILDING

IDENTIFICATION CODE
02 017

THE CONTEXT

BILOGARD BUILDING FRONT
SIDEWALK
DUSTBIN

DIGITAL SURVEY

1 - ACQUISITION

CAMERA	OBJECT	CONTEXT
focal length: 35	n° pictures: 7	elements that cover the front: yes
iso: 100	elements: 5	+ trees: no
shutter: 1/648	+ fronts: no	+ cars: no
focus: auto	+ trees visibility: 100%	+ other: no

2 - POST PRODUCTION

Align the photos

Generating dense cloud, mesh and texture

FRONT CENSUS

BUILDING ASPECT

Location: n° 29, улица Фрунзе, LOT 02

Function of the building: RESIDENTIAL COMMERCIAL MIX

N° Floor: 1 2 3 4 5

Construction: WOOD CONCRETE BRICKS

Foundation: UNKNOWN WOOD CONCRETE BRICKS

Roof typology: 2 PITCHES 4 PITCHES FLAT ROOF

MAIN FRONT ASPECT

Character of the main front:

Decorative elements: YES NO

Presence of external elements: TERRACE BOW WINDOW

Front Colours: [Red] [White] [Black] [Grey] [Light Grey] [Dark Grey] [Blue] [Green]

Materials: BRICKS PLASTER WOOD METAL STONE MARBLE STUCCO CERAMIC COATING

General state of front preservation: GOOD SUFFICIENT BAD

Presence of structural invisibilities: YES NO

Disfiguring elements:

Anthropic alteration: INCONGRUOUS PATH MURALS OF GRAFFITI OTHER - AIR CONDITIONERS

Chemical-biological alteration: MOSSES OR LICHENS COLOR ALTERATION SALT EFFLORESCENCE METAL OXIDATION OTHER

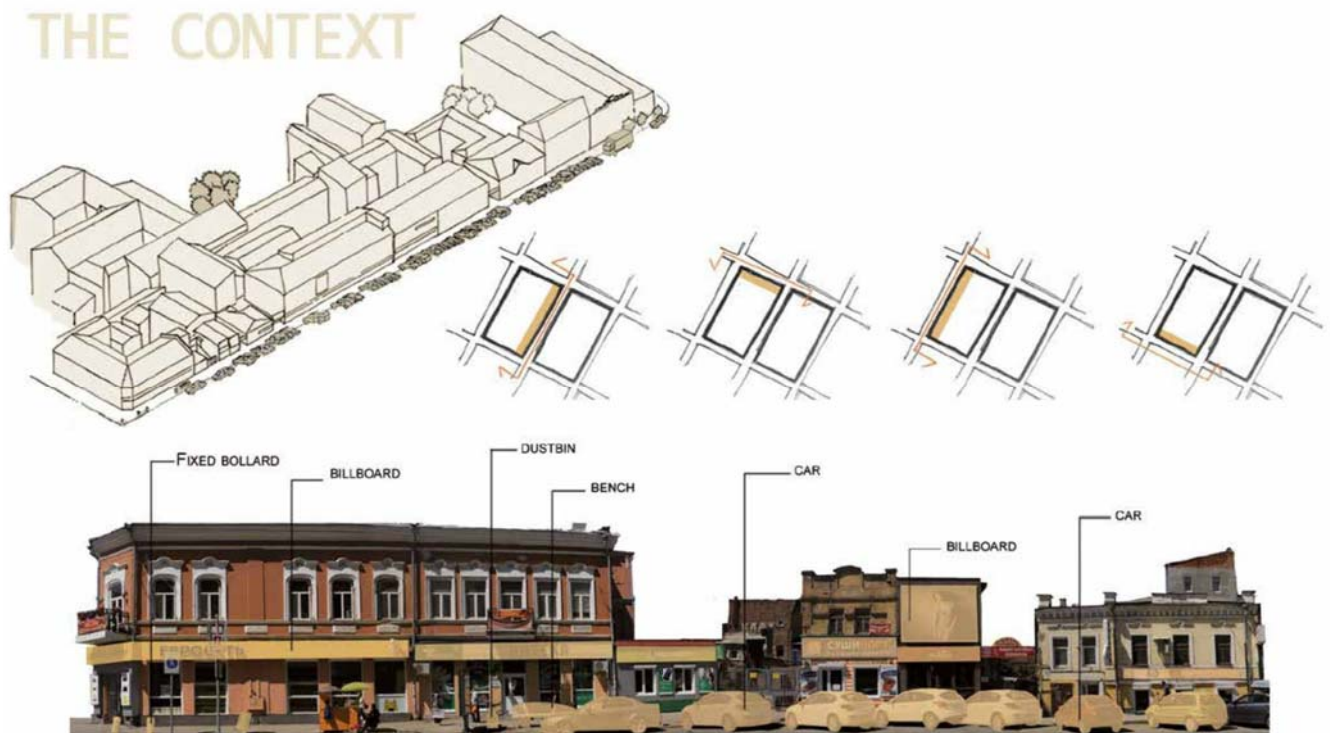
Physical-structural alteration: CRACKS MATERIAL LACKS OTHER

MAIN FRONT

Detail 1
corner terrace

Detail 2
decorative elements of the first floor's windows

Detail 4
corner detail



With a view to digitalizing the architectural heritage the 3D model has proved an effective support for documenting and investigating the transformations of an object to facilitate its diffusion in the community.

The output of this application ranges from virtual navigation to the realization of GIS systems with descriptive schedules. In this system it could be possible to draw thematic maps essential for the understanding of the relationship between different systems, natural and human, that coexist in the same area. With these instruments it is also possible to identify intrinsic dynamics of the areas elements that have determined unusual developments or specific urban phenomena. The study of the current appearance of the Samara city center is necessary to set analysis on the building conservation. So, starting from the analysis of the architectural and environmental systems for the production of atlases for the landscape, till the analysis of systems for the restoration, conservation and valorization of the architectural heritage, it has been possible realized a structure in which all the complexity related to the appearance of the street are synthetize with all the quantitative and qualitative information needed for the complete configuration of the place.

Notes

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¹ The collaboration with the Russian Samara State University and Perm State University started in 2012 with three workshop finalized to students exchange for the study of Russian Landscape and city center. The project is carried out by the author inside the laboratory of *Landscape, Survey and Design*, coordinated by Prof. Stefano Bertocci, University of Florence, and Prof. Sandro Parrinello, University of Pavia. The project include some urban cases, with different characteristics of density and structure, from the Carelian village (Fed. Russian), passing through the Caribbean village of Portobelo (Panama), up to more complex and dense urban systems in Russia and Italy.

² Lynch argued that the analysis of the shape of the city and its effects on citizen perception is one of the foundations of urban design, capable of generating products in which the citizen himself can configure its mental structure clear and organized. Cfr. Kevin Lynch, *The image of the City*. 1960.

³ Cfr. Parrinello S., Picchio F. (2015) breaking down and recomposing the landscape using *structure from motion* survey methods applied to historic karelian villages *the case study of the wooden village of korza*.

Scires IT, SCientific RESearch and Information Technology.

⁴ Ibidem

⁵ The purpose of the 3d model must be established before starting the acquisition campaign, the amount of data which the shape from motion method is able to convey is vast and only by establishing the scope and purpose of the model in advance breaking down and recomposing the landscape using *structure from motion* survey methods applied to urban structure, is it possible to optimize and make the data produced easily utilizable on different scales and for different types of users.

⁶ For a more in-depth treatise of the topic See. De Luca, 2011.

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