Information Field of the Modern city silhouette

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Abstract. A modern city in all its aspects is a product of diverse information and semantic features that have been expressed in different ways in different times. Time continuum of urban existence and globalization are leading to universalization of rules and methods, on the one hand, and to the destruction of the identity and integrity of the landscape and architectural urban environment, on the other. They are demolishing the system of conceptual references and transforming historic time-tested cultural codes. Today the system information balance is intensively evolving under the influence of time and objective information reality, shifting historically tested and conventional highlights. The information field of the city silhouette is considered as integrity, having a universal algorithm and code, whose revealing and defining promote the recognition and proper interpretation of the most typical features of the contemporary urban environment in the city silhouette structure. The use of the algorithm and code as design and analytical tools for city planning enables to create integrated structures and unify conceptual information on the city silhouette, which form the system of landmarks for human world perception.

1. Introduction

Information surrounds a person completely and continuously from the very birth. The newborn immediately begins exploring the available information field of environment along with solving different problems. To solve some of them it is enough to learn only environmental properties, objects and processes, while for the others, it is necessary to gain knowledge and create an integral world outlook. The modern world is a space of large-scale structures with multi-layer information, where technologies have become an instrument, while information has been used to influence people. Information field is a unified mechanism of context parameters impact (information selection, reception and transmission), based on the diverse perception of the environment that reflects the world outlook.

The first visual information that a person gets when approaching an urban area is its silhouette – a historic cumulative outline expression of city facilities in the skyline that is visible while approaching a city. The architectural silhouette provides a person with the initial landmarks in the city structure, while the skyline outline itself communicates essential information. The silhouette line is a kind of an electrocardiogram of the city life, especially at present, when its size is quite impressive. Therefore, the silhouette as a “boundary between the city “body” and the endless sky”, conceptually contains two key elements, the sky and the land, their interaction and opposition [1, p.258]. Two spaces – the sky and the land – have long history of interaction, overlapping and reflection. The sky responds to the uplifts of the land, where natural landscape shapes and urban architectural shapes, being combined, form the
interaction line – the city silhouette outline. These two elements influence each other, generate strong images, metaphors, symbols and signs, create meaningful structures, expressed in the encoded text of three-dimensional shapes. The landscape acts as a layer of information about given and existing natural forms, which have been inspiring mankind for centuries to create architectural forms – the models of universal landscapes (a “signified” in the sign structure). Architecture is primarily information about the reflected reality in the urban environment structure (a “signifier” in the sign structure). Therefore, both the sky and the land, as a system of objective emotional-and-imaginary oppositions, including tectonic, light, space-time, play an important part in various manifestations and relations. In the cultural tradition, the sky acts as a structure shaping thing generated by land (table1). The sky is a cover, protection, or a dome defending the land from adverse external factors and invasions. It provides a shade to the land, protects it from “inhuman” outer light.

The universal sky-land opposition is elaborated at the level of the earth surface shapes and is expressed as a geometric antithesis. The sky is conventionally represented by two images, having bright silhouette characteristics – mountains and domes. The mountain is considered to be a cosmic image of light and world integrity. Therewith, the dome symbolizes the way the sky limits the human inner world. The land is traditionally thought to be chthonian (dark and deep), related to the death realm. The loose mass of the mountain here brings about the associations of the heavy underworld and abyss. However, being “lit” with the skylight, inspired land becomes a favorable place for people to live. Thus, a city with its vertical structures and regularity is the most complete model of the Heavenly City. It combines the images of the sky and land, influenced by nature and perceived so that there is always interaction with nature and a divine element (table 1).

2. Silhouette
From time immemorial the man “has been invading the sky with vertical buildings, which were special to people”. Religious and public facilities have always dominated the “city massive, and it is their interaction that visually shaped the silhouette, interpreted as an art object” [1, p.259-260]. Pyramids went into the sky with their waning steps or darted with the silhouette diagonal planes, belfries and spires of Christian cathedrals, prayer towers and mosques, the levels of Buddhist pagodas, “cur the sky open” with their sophisticated shapes, while palaces and temples were placed on high platforms. The silhouette spot is the most emotionally intense part of the visual information, whereas its morphological properties, related to the shape content trigger “the whole image recognizing process” [2, p.22].

The conventional human activities historically corresponded to the horizontal line, meaning that any vertical ones were efforts and challenges to the sky [1, p.258]. In landscape shapes the horizontal line usually corresponds to the endlessly “stretching” natural shapes of fields, seas, or steppes. In architectural shapes the horizontal line is easily found in the long lines of massive built-up areas and impressive public facilities. The vertical axis, as opposed to the horizontal one, in the landscape and architecture, is immediately identified by the viewer in the city silhouette as something unique, highlighted by nature or people and also conveying a special meaning (table 2). The equality of the “horizontal and vertical” lines exists only in the abstract system of Cartesian ordinates, since for the person the horizontal surface is not related to any difficulties in movement. Due to this reason, any horizontal misalignment is clearly recorded by our consciousness and remembered. This surface play creates the link between the internal and external (according to Heidegger, a “bend”), where “the land and world respond to each other by lifting an object as a product” [3, p.268]. This interaction outlines the object – its silhouette, freely accepting its “dents, planes and cuts, their correlation and alienation” [3, p.275].

The vector of architectural shape information, the architectural silhouette is “visually the most memorable, impressive property of the common space organization of the architectural form, reflecting significant topological features of the object content” [2, p.22]. Information qualities of the city
silhouette are, firstly, defined by the mutual determination of the weight and space, because architecture becomes an art only if the synthesis of weight and space is “experienced as an artistic … a spiritual value”. These are essentially rooted in the deep unconscious and organic instincts [4, p. 9].

Table 1. From the morphology to semantic-semiotic construction of the landscape-architectural composition

| Architectural object (morphological structure) | Semantic-semiotic construction |
|-----------------------------------------------|---------------------------------|
| **SIGN – SIGNIFIER**                          | **MODEL, IMAGE**                | **SIGNIFIED (meaning)**        |
| Pronounced vertical as a natural elevation vertex. | «World tree»,                   | STATEMENT of STABILITY,        |
|                                               | «World axis»                    | CENTRALIZATION                 |
| Spatial form, as a top of the natural elevation. | Crown                           | SKY, POWER, DOMINANCE, CROWN   |
| Dome or arch form as a repetition of natural form of an elevation (mountain or hill). | Dome, arch, marquee as a cover | TOP, SKY, SKY DOME, SKY COVER  |
| Dome form on the plane.                       | Arch, marquee, tent as a sacred center, opposed to the periphery | "SKY ON THE LAND", SACRED "MIDDLE" |
| Active vertical, visible on the sky background. | Column with a cloth thrown over it, Pillar, upon which the sky rests. | PILLAR (SKY), POWER (SKY) |
| Stepped form, gradually increasing to the center. |                                 | COMMUNICATION (SKY AND LAND CONNECTION) |

Secondly, they are defined by the feeling of “marking and celebrating, since it is something long and stable, opposed to the temporary changeable flow…” [5, p. 10]. Thirdly, they are defined at the level of
plastic world perception – anthropomorphic features of the otherness, since it is shaped in perception or creation. “As the cubic not-self is assessed in its relation to the human body, naturally, it is shown or created after its image and likeness and, in turn, the degree of anthropopathy is a criterion of value: the less organic the otherness is, the harder it is to experience it, live through it empathically. Still, it is perceived as morally valuable. In spiritual creativity a shapeless or sharp facet stereometric item can become a symbol of the matter hostile and rebellious to the spirit” [5, p. 10]. This position is directly related to natural (organic) properties of the architectural silhouette design, while the above features of the externally perceived architectural object encourage the formation of internally limited values. Contemporary architecture does not dominate any more in creating moral ideals and esthetic values; it is actively losing its in-depth semantics and content, generated by centennial traditions, science and culture. The phenomenon of the architectural and city planning information field as a system consists in conveying information from the author (architect, city planner) to the consumer (a citizen, a city dweller) via three-dimensional and silhouette forms. For instance, the dominated city silhouette form can convey information at a distance, in particular, of an internal space with important qualities that determine the city life and spirit.

Table 2. Stable interconnections of semantics landscape and semantics of the city’s architectural silhouette

| Semantics of landscape form | Semantics of architectural silhouette |
|-----------------------------|---------------------------------------|
| **Horizontal** surface of the earth – stability, peace, accessibility, lack of information. | **Vertical** – stopping the gaze, effort, “manifestation of human will”, the connection of the sacred point of the city with Heaven. |
| **Vertical** – elevation, inaccessibility, correlation with the sky. | **Horizontal** – familiar, everyday world of residential areas. |

Many vertical accents that form a picturesque silhouette, gives the human eye points that delay the gaze of a human being.

Differences between horizontal and vertical elements form heterogeneity, dissimilarity and rhythm disruption – unpredictability as a function of information content.

The presence of similarities, constancy, makes the silhouette predictable, and therefore less informative (according to Fomenko O. A.).

With time city silhouettes change, depending on numerous factors, including natural, social, economic, practical ones. In the ancient ad medieval times, for example, town silhouettes were normally practically oriented as they considered mainly their defense needs. That way a town or a fortress used to gain their natural silhouette, symbolic meaning as well as class, ideological and political content. It had to express
power, strength, magnificence and inaccessibility from afar. It had to command respect and fear to external enemies and local dwellers. As a result, the urban silhouette was mainly formed by the shapes of the key public buildings, while a person, approaching the town or city, could easily recognize its facilities at a distance. During the following several centuries, the silhouette, especially that of larger cities, told about its size and financial standing, about the level of technologies and their development and thus the city showed its living standards from afar. It was due to those changes the silhouettes of modern cities were gradually complemented with large-scale palaces and administrative buildings, industrial facilities, office and shopping malls, and elite housing estates.

3. Information field
The information field or the field is used as a term in a number of sciences to describe the properties of the real space and real world and, it is usually related to the continuous or discrete totality of values, reflecting a properties or one of the properties of the environment. The unified information field system enables to combine various aspects and features, properties and concepts, while monitoring and analyzing their relations and interaction. The wide use of the concept in science and research allows us to use it in the information science, too, where architecture, as an interdisciplinary area, plays an important role in the visual information domain. The city silhouette information field is determined by the algorithm of the system elements interaction, where the system unites not only its structural elements but also various characteristics. The art of architecture and city planning is created in space and time, generating unique interdisciplinary knowledge products, complemented by the talents of architects. The formation of the algorithm as a tool to structure multidimensionality of contemporary information processes enables to create integrated systems of individual facilities, ensembles as parts of the multifaceted urban design and eventually as the harmonious environment and holistic world image.

The history of architecture and city planning art shows that ancient cities normally kept their original easily recognizable images for centuries. “The law of the individual silhouette” of old cities appeared quite durable, as in the 19-20th centuries it was necessary only to comply with it, since the silhouette is the essential means of orienting in the city space and historical time [1, p.262]. That was once stated by N. Karamzin in his records. Nonetheless, rapid development and urban sprawl of the past two centuries disturbed the above compliance with the unwritten “law on the city spacial harmony and silhouette expressiveness” [6, p.237]. Those resulted in a new layer that complicated the information field of a modern city silhouette. Thus, what was once generated and repeatedly “overlayed” creatively complicated the city image and made it unique. City landscapes have become regular, logical and picturesque background for modern advanced urban architectural forms.

Information relations are vital for the information field. They reflect correlation between real objects and elements of the system. Information relations are a mandatory factor of people’s knowledge of the world and their place in it. These relations may be expressed explicitly: in a hierarchy, the part and the whole, etc., or implicitly, for instance, in associations or images. Initially, the foundation of each city unique image is in the original combination of the elements of architectural and landscape environment. The organic connection between the city and natural environment has kept its top priority at all stages of the city planning development – from the ancient times to these days. The relief primarily determines the extent of its space expressiveness, since it is the base of the landscape and architectural urban space, while the picturesque silhouette, with numerous vertical highlights, provides people with the landmarks that are eye-catching and well-recognizable from any perspective (table 3).

4. Content (meaning)
An integral part of the city silhouette information field is its content, necessary for unambiguous interpretation of urban facilities and objects, as well as for their information clarity. The city silhouette information field is structurally complex and unites a variety of features from philosophical and functional to imaginary and psychological ones, which encourages the formation of internal incapacitated
values. Semantic units create numerous structures, expressed with space stereometric means in city silhouette lines. In effect, the aim of creating the city silhouette as an object to be perceived is to inform of its content.

According to the information theory the content is to be understood as a major property of information. From the semantic load viewpoint, information depends on its purpose and target. The city or its fragment silhouette contains encoded morphological, semiotic, symbolic, metaphoric, semantic and other information on the functional and esthetic components of the urban architectural environment, and on the nature of the landscape as the city morphological basis. Primary data on a city is perceived by a person at a distance, from the silhouette line pattern. This information can also refer to the city life, city structural facilities – that is the first stage of cognition. By uniting with emotional and associative aspects, morphological characteristics become creative and imaginary, while the higher outline complexity generates an emotional and associative outburst, where most significance is paid to the very fragments of the silhouette that are hard to read in such multilayered and multifaceted text. In this case, architectural forms become more expressive and they are easier to be interpreted, especially if they are intensified with landscape shapes with similarities or differences (major types of interaction of three-dimensional shapes and the landscape).

4.1. Morphological structure
The first stage of recognizing the silhouette, in particular, that of a city, is reading and analyzing the morphological structure of its composition. The next step is related to one of the main phenomena of the shape perception – the phenomenon of outlining a figure out of the background, since the whole perception field, primarily the eyesight, clearly differentiates various parts. A substantial figure or an object belongs to this part, while the other includes the background, where a “thing” is perceived and, unlike a figure, has the material property [8, p. 79]. The following step is in singling out the nature of correlation of the figure and background. It regards the architectural silhouette, the feature analysis of the natural countryside relief shape (a hill, plane etc.) and the form of an architectural object, as well as each further layer of the silhouette (table 3).

4.2. Sign structure
The information value of an architectural facility is also determined by its sign structure. The sign structure is based on the sign, which is defined as a material object, having a meaning, and it is considered as a structure with double characteristics. These characteristics are formed by the opposition of the signified–signifier, where the signifier is the material value, where the culture and history are embodied, materialized, while the signified is the spiritual experience, giving the perspective for us to perceive, live through and understand the signifier. Thus, the sign is the result of the signified–signifier interaction, which reveals the cultural-historical – objective, factual and still experienced significance of the phenomenon [9]. Signs as the units of this structure are united and logically integrated to form a text – the material embodiment of the system. The system reflects esthetic properties – meaning and content, expressed through the elements of the silhouette composition. However, having identified the value as a symbol, and the signified as a thought or a reference, Ch. Ogden and A. Richards added the third referent element, representing an object (event) to refer to [2, p. 45]. Then the meaning is characterized by the relations between the sign (signifier) and the field of interpretation (signified), where interpretation is a way through a metaphor to an image. The metaphor, which can be based on the similarity of any qualities or properties (color, shape, volume, purpose, position etc.), enables to create full images based on bright and unexpected associations. Moreover, there is a definition of a sign not only as a material object that has its meaning, but also as a material object integrated with its meaning. Using this approach to the sign, it appears to be two-faceted, i.e. having form and content.
Table 3. Fundamental sign elements of the landscape-architectural city silhouette structure [7, p. 181]

| Landscape form as a sign | SIGNIFIER | SIGNIFIED | Architectural equivalent of signified |
|-------------------------|-----------|-----------|--------------------------------------|
| Mountain                | Convex    | Model of universe | Marquee, bower, tent, dome |
|                         | (upward)  | World mountain    |                                      |
| Hollow                  | Convex    | Mountain – Sky   | Cave in the mountain |
|                         | (downward)| Entrance to the sky (mountain top) | Entrance to the underworld (piedmont) |
| Plain                   | Horizontal, at horizon level | Expanse, vastness, empty space | Flat, horizontal forms |
| Field                   |          | Vastness and boundless expanse, bright open space |                                      |
| Forest                  | Horizontal, above the horizon | Wild form, danger |                                      |
| Sea                     | Horizontal, moving undulation | «Inverted» sky | Dept, going down |
| Steppe                  |          | Vastness | Vastness, oscillatory motion, rhythm, a sense of the infinite, referring to the «beginning» |

When analyzing the sign structure of the city silhouette, it seems to be necessary to divide the sign structure into the typological elements according to the understanding of the composition as a single integrated unit to be perceived. This unit combines functional and esthetic aspects. Umberto Eco noted that “the very consideration of our relations with architecture proves that normally, dealing with it, we get involved in a communication act, which does not exclude functionality” [10, p. 204]; “…our approach to semiology allows us to see an architectural sign as a signifier, whose signified is its own functional purpose” [10, p. 211]. Yet, it is to be mentioned that the functional purpose of architecture
may be studied not only from pragmatic perspective, but also from its artistic esthetic qualities. Consequently, from the communication viewpoint, the system of architectural signs must reflect both aspects.

The silhouette of a city or its ensemble may inform the viewer of the functional organization (the availability and location of the center and periphery, the availability of built-up areas in the top and bottom points of the relief etc.). The sign structure that reveals the correlation of the dominant and subordinate composition elements, the scale and rhythmical organization of the silhouette, and it reflects esthetic qualities as well. Logically and systematically united signs make up a text as the material side of the system. This text has a single meaning and can be considered as an indivisible signal (including an ensemble, a town etc.) with its specific features, recognizable to its recipients. The text must have its boundaries, the beginning and end, internal components and organization, providing it with integrity at the symbolic level and turning it into a literary text (as a total of phrases), which creates a meta-structure at the level of creative organization.

Silhouette forms with bright information qualities should include vertical and horizontal ones (either natural or man-made). Therefore, supposedly, silhouette drawings outlining the general landscape features have this important communicative feature: flat terrain (horizontal), highland (upward oriented) or lowland (deepened). The shapes, whose silhouettes are broken down or simplified have semiotic qualities. They also involve planned character of the viewed image, which forms a consistent layering of the silhouettes from different layouts and there emerges a difference between the silhouette of the object as visible on the sky background, on the distant landscape background or on the built-up area background. Another important sign factor is the degree of highlighting the city silhouette on the surrounding landscape, the opposition or, vice versa, fusion of anthropogenic and natural environment. All these sign forms are integrated thus forming the text, concept, referring to the essential concepts of semiotics, implying an invariant (stable) system of relations between structural levels and within the levels, the whole environment, the activity etc. [9, p. 63]. The semantic element of the textual (sign) structure is based on the signifier – signified relations. The concepts of “content” and “meaning” are tightly related though sometimes they are separated. According to G. Frege [11], meaning characterizes the relation between the sign and the object it denotes (e.g., words “house” and “home” linked with a place of residence), and also a reference to other signs. The meaning characterizes the relations between the sign, its meaning and the field of interpretation (naming). Accordingly, this concept is implicit, directly dependent on the knowledge on the object [12]. A strange thing may seem to be meaningless if there is no knowledge of its use, i.e. how to benefit from it or what it is for. The meaning may also include implied or expressed purpose of items, words, concepts or actions, given to them by a specific person or a community. The opposite of meaning is meaninglessness, i.e. the absence of a clear purpose.

4.3. Semiotic-semantic relations

As regards semiotic-semantic relations among landscape and architectural city shapes and the principles of their compositional expression in the city silhouette, it is important to note U. Eco’s statement that “the transfer of a feature to a different text is one of the essential means to create new meanings” [10, p. 62]. Landscape forms underlying the city composition, as mentioned above, convey a traditional meaning, which is revealed through archetypal and mythopoetic codes. A mountain, a valley, a river, the land surface, a steppe or woods are themselves the sources of meaning generating images. Here, the meaning, understood as imaginary or real purpose, includes functional-pragmatic landscape uses and its esthetic-interpretational features.

According to the concepts of Gestalt psychology, the perception of the integral composition is related to the consciousness orientation on the perception of simple and regular structures. At the same time, the concept of simplicity is related rather to the organization of the complex material using the minimum number of systematized structural links than to the fact that the object has a limited number of features
[13]. However, it should be added that the creative aspect is inversely related to simplicity and features more complex perception, which can lead to the experience effect, according to the interpretation of the concepts of disposition and composition by L. Vygotsky. The simplest shapes, perceived by a person as two-dimensional (silhouette), are major geometric shapes (squares, circles, rectangles, triangle and a trapeze). In the architectural-landscape silhouette, a methodological way is a possibility to identify such elements as characteristic sings that are quite easy to read by an observer. These forms as signifiers may be interpreted imaginarily and symbolically as those meeting the major landscape opposition sky-land (signified). Nevertheless, their interpretation may be complemented with interconnections and relations between the forms themselves and their surroundings. For instance, we may identify structural options: whether the sky visually occupies more or less space than the land; the object silhouette is visible on the background of the sky or land, forest, sea etc. Therewith, the next step to take is to identify the features, characterizing their combinations and complementing the seeming simplicity. That kind of a complementary element includes, inter alia, a silhouette layout blurring, blurred connections or the explicit opposition of the landscape and architectural forms. The identification of the relations among these forms appears significant, since landscape forms, as signs, convey their meanings (signifier – signified) to the architectural structure, while architectural forms with landscape features combine them with their own meaning. As a result, the information field of the city silhouette becomes a carrier of diverse meanings, strengthening (or mitigating) each other. Thus, it may be stated that the information load of the city silhouette is determined by the major morphological types: visual fixation spots, silhouette elements (landscape and architectural), typical linear shapes, systematization based on contrast or similarity, fixation of rhythmical and dynamic silhouette features, bringing the silhouette shape to a geometrically identifiable shape.

5. Conclusion

A modern city is full of diverse information, which complements and complicates its silhouette, most often reflecting neither its city planning structure nor its architectural image, neither its traditions nor functions, esthetics or other features, as it used to happen in the past. Beneficial space or silhouette locations in the urban structure are increasingly often occupied by insignificant public or historic legacy facilities, while the visual information elements (logos and street signs, landmarks and indicators, outdoor banners, communication towers etc.). This shift of the priorities entails not only adverse layering of different facilities in the city structure and silhouette, but also often to minimization of their significance, the loss of meaning and content or their complete destruction.

Architecture and city planning, as a system reflecting the environment integrity, encourage harmonization of the environment by the unity of the space principles and techniques as well as by the integrity of the information structure (algorithm) and communication language (code). The urban environment speaks its unique language, reflecting the dialogue in time using signs, symbols and meanings. The modern city and its silhouette are shown to the person as a work of art: here the nuclear historic center ensemble continues generating new structural elements. A new architectural layer of each period provides information in a new language, where the new contemporary language is the interpretation of the truly old, ancient, and historic archetype-based legacy. It is generated by the system of new relations in the information field, where signs and symbols are provided with fresh meanings. For instance, conventional harmony and logic of the historic city silhouette is destroyed, since the meaningful context of the modern environment does not correspond or come from history. That inevitably damages the information balances, ruins the urban environment integrity and the uniqueness of its code, generating a new reality with a new code and new algorithms. A person (both a maker and a consumer), who knows the code and the system (algorithm), can clearly read the multi-faceted structure of the modern city in its silhouette. Using conventional, historical categories, the city silhouette is a factor that facilitates person’s orientation in the urban environment, forms the world outlook and establishes relations with the natural environment.
The silhouette of the modern city is influenced by globalization, information and other technologies development, which promote the emergence of new meanings. The synthesis of information and content parameters universalizes the diversity, removing uniqueness and actually leading to the fake meaning context, the code changes – the existing features are substituted with new ones. Certain meanings can be fully destroyed, while others are replaced with the opposite, thus distorting the conventional and understandable text. It requires creation of the new regularity (a new code) and a new language. There emerges imbalance not only in the semiotic, semantic but also generally in the global information field, generating a flow of images. These lose their meaningful elements and cannot be referred to a historic period or to the specific features of the landscape and culture, where the person loses the vital feeling of order and stability in the world around. It is based on the unity and systematization of landscape and architectural features that the city silhouette, which helps to build meaningful updated contexts, becomes unique. It contains combinations of codes, which algorithmically lead to diversity, and also stable images and meanings of the city structures in the information field of the city silhouette.

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