

DOI: 10.21005/pif.2018.35.C-01

## ANGULAR HARMONY IN ARCHITECTURAL DESIGN OF CITY SKETCH

**Vasyl Kuzmych**  
Senior Lecturer

**Andrii Pavliv**  
PhD, Associate professor

**Juliana Petrovska**  
PhD, Senior Lecturer

Lviv Polytechnic National University  
Institute of Architecture  
Department of Design and Fundamental Architecture

### ABSTRACT

The city image harmony is an important problem all over the world. The architects faces the same problem in designing of modern urban structure. The proposed methodology combines the aesthetic component of architectural design with normative and planning requirements. The aim is to obtain more qualitative and harmonic design documentation, as the final product of architectural design. Also the main principle is the methodology to achieve the harmony of city panorama solution in an architectural project. The article is dedicated to the analysis system with initial comparison in relation to the smaller angle of study. Examples are given within the framework of orthogonal projection, or in plane solution, but the patterns are also applicable to the spatial structure of the composition.

Key words: city, town-planning sweep, city canvass, angular ratio, horizon line.

## 1. INTRODUCTION

Accidental and chaotic solutions in creating visual interconnection of the main objects and structures, which are commonly based on economic limitations, such as the land cost, is common problem in the process of city sketching when designing the city panorama. It is the usual way of city planning, which is regulated by requirements of standards and economic indicators of the site plan.

However, in real conditions, at visual observation from site seeing points, the non-harmonic location of objects in spatial environment of the city becomes apparent. The task of urban areas planning is to organize a panoramic view, or site seeing points program for better city exterior perception. This is especially important for complex topography of historic cities. The spectacular view points gives even more aesthetic value to the city, which contributes to the tourism business development, as well as flow of finance for the city development, conservation and restoration of architectural monuments, construction of new objects.

## 2. FORMULATION OF THE PROBLEM

The city image harmony is an important problem all over the world. The architects faces the same problem in designing of modern urban structure. At the first stage of the project it is considered as an orthogonal projection with a certain ratio of height and width of objects. There are many of such nets in different directions, and their angular spatial vision creates a 3D view.

In conditions of densely built-up area and high land cost, the building industry confronts the aesthetic needs of customers, ecological and sanitary requirements, the problem of insulation processes, and other factors ensuring comfortable life of citizens. As a result of such confrontation the construction standards is often ignored in architectural design.

Among the common wishes of customers who want to buy better apartments to the technical and economic factors nowadays visual and aesthetic factors are added, such as a view of natural landscape, forest, sea, etc. Balconies, loggias, terraces, aerials, penthouses by default provide viewing points and panoramic views. On the one hand, the program is designed to perceive aesthetically harmonious streams of visual series. On the other hand, the proposed views not always can attribute to aesthetically harmonious perception of the environment.

Analyzing the layout of many historical cities, we can find examples of defensive and observational functions that are organically interlaced. The reason of such layout solutions is the nature of human perception. In modern design creation of architectural structures within the natural environment and ecologically save materials becomes more and more common. In daily life cycle of modern people, there is a problem of long-term staying in closed or partially closed spaces and environments [1]. As a result, a person receives a limited amount of energy flows in comparison to the case of living in open natural environment. In other words, a person feels the lack of energy quantum flows of certain quantities and lengths that historically was a characteristic feature of living on the nature. This is especially noticeable in big metropolises, where people encounter energy hunger of certain frequency, which leads to visual and mental disorders [4].

## 3. ANGULAR HARMONY SOLUTIONS IN ARCHITECTURAL DESIGN

The proposed methodological system is presented in context of image perception by ganglion cells. Color vision is provided by three different types of retinal cones, as well as the optic neurons of the visual channel. Properties of spectral opponency have retinal ganglion cells, LGN neurons of visual cortex, such as P-cells. The other neurons, M-cells react to light brightness, but not to the opponent colors. The color-specific neurons form

clusters in the visual cortex in a form of "pins". The relationship between lazodominant and orientational columns with color-specific "pins" is shown on Fig.1 [2].

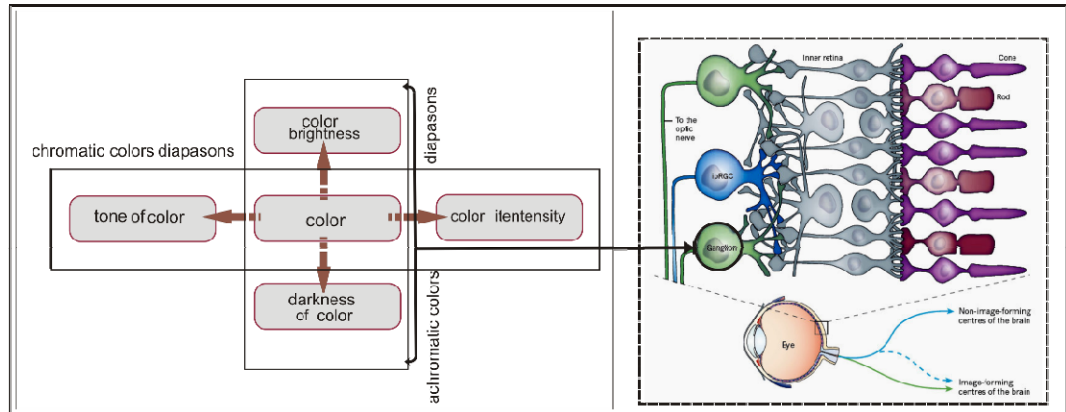


Fig. 1. Scheme of structural properties of colors. Source: Copyright of Kuzmych V. I.

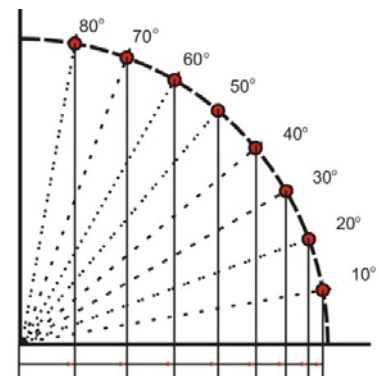


Fig. 2. Progression of the recommended linear planning distances depending on the angle of constraint of the building. Source: Copyright of Kuzmych V. I.

In this case, we exclude the perception of cone and rod receptors, or analysis within the chromatic colors of visible spectrum. This approach gives an opportunity to understand the geometric parameters of an object within the framework of X, Y, Z vectors, linear values and distances between objects. Such approach is often called volumetric spatial analysis. Generally, the aspect of achromatic perception of geometric parameters at the level of contour sketch is investigated. The active component is also the linear coordinate representation of distances between objects. The final version of the complex approach involves analysis of not only linear geometric and psychophysical components, but also qualitative coloristic and psychological components. In the process of visual perceptions of the environment, we first identify the object and its main parameters. In the visual center of our brain we compare it with the known analogues and only after that we assign a qualitative colouristic feature to the object [3].

The proposed system is oriented on linear geometric component. The set of sketch coordinate points in a certain system of linear distances or spatial interrelations, is analyzed in connection with the gravity vertical, which serves as the basic constraint for conducting the study. The length of projection of the angle diagonal on a horizontal basis gives us the recommended linear value of the planning and design parameters. The sum of displacements of angular coordinates in a certain system gives us understanding of harmony of visual series interconnections in architectural design of city panorama. The most important issue in this process is the structure and features of human visual apparatus.

Using such relationships between architectural objects we can greatly enhance the aesthetic quality of the city.

Let us consider main cases and variants within which we conduct the study. In addition to illustrated here decimal variants, intermediate unit variants of application of the principles of angular harmony in designing are possible. An important factor is the interconnection of planning constraints of architectural objects, which is based on sanitary norms of construction and principles of angular harmony. For example, let us take the angles of  $10^\circ$ ,  $20^\circ$ ,  $30^\circ$ ,  $40^\circ$ ,  $50^\circ$ ,  $60^\circ$ ,  $70^\circ$  and  $80^\circ$ . The intermediate angles between these proposed ones are possible. It all depends on the situation and the tasks set for the architect. The main principle is the methodology to achieve the harmony of city panorama solution in an architectural project. These principles are preserved not only within the limits of orthogonal projections, but also in the spatial arrangement of architectural structures. For a better understanding of the problem, the three-dimensional aspect is not given. The article is dedicated to the analysis system with initial comparison in relation to the smaller angle of study.

The infinite number of points located on a sloping line at angles  $10^\circ$ ,  $20^\circ$ ,  $30^\circ$ ,  $40^\circ$ ,  $50^\circ$ ,  $60^\circ$ ,  $70^\circ$ ,  $80^\circ$  form the spatial coordinate constraint of nodal coordinates points, that influence the choice of parameters of the object and spatial interconnection with other components of composition. As a result of such approach, the location of structures and buildings will be in a harmonious relationship of visual signals that affect the formation of urban architectural net of the city. The system can be corrected in horizontal direction to meet planning and normative requirements according to the site plan and concept of the idea. Examples are given within the framework of orthogonal projection, or in plane solution, but the patterns are also applicable to the spatial structure of the composition. The schemes of the angular harmony solutions at angles  $10^\circ$ ,  $20^\circ$ ,  $30^\circ$ ,  $40^\circ$ ,  $50^\circ$ ,  $60^\circ$ ,  $70^\circ$ ,  $80^\circ$  are shown in Figures 3, 4, 5, 6, 7, 8, 9, 10.

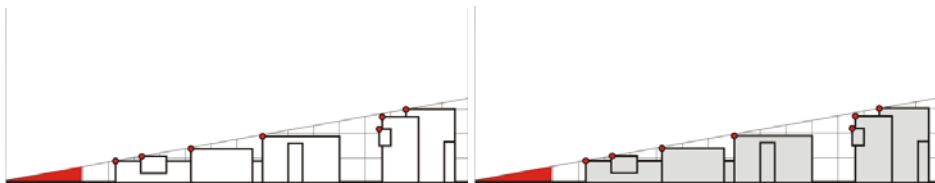


Fig. 3 The scheme of the angular harmony solution at angle  $10^\circ$ . Source: Copyright of Kuzmych V. I

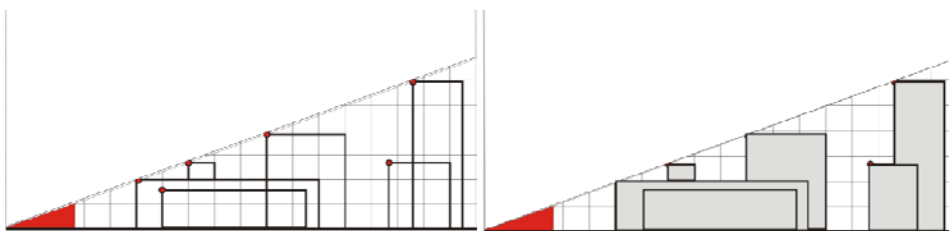


Fig. 4 The scheme of the angular harmony solution at angle  $20^\circ$ . Source: Copyright of Kuzmych V. I

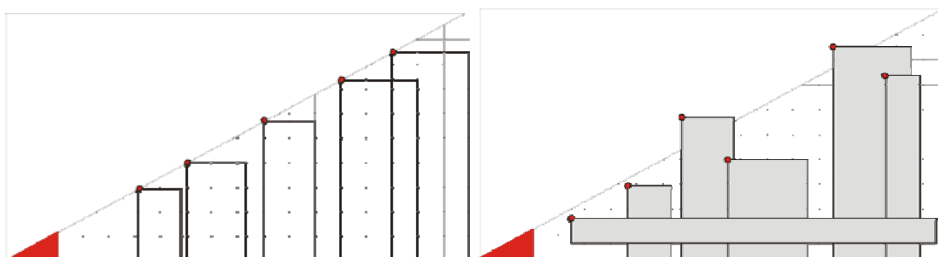


Fig. 5 The scheme of the angular harmony solution at angle  $30^\circ$ . Source: Copyright of Kuzmych V. I

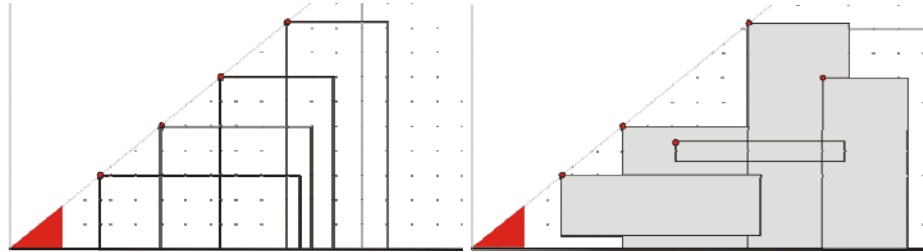


Fig. 6 The scheme of the angular harmony solution at angle 40°. Source: Copyright of Kuzmych V. I

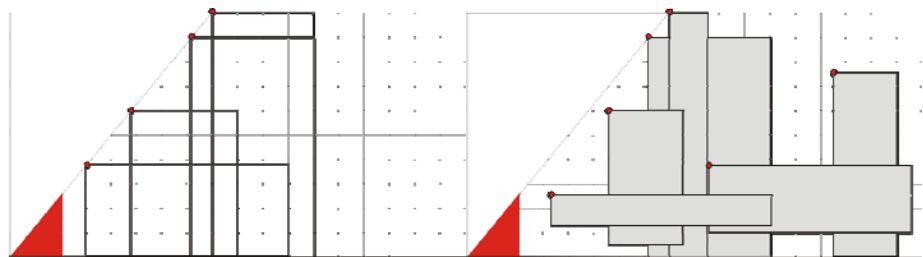


Fig. 7 The scheme of the angular harmony solution at angle 50°. Source: Copyright of Kuzmych V. I

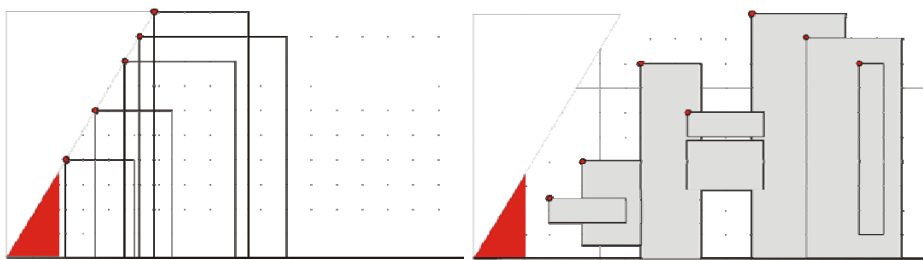


Fig. 8 The scheme of the angular harmony solution at angle 60°. Source: Copyright of Kuzmych V. I

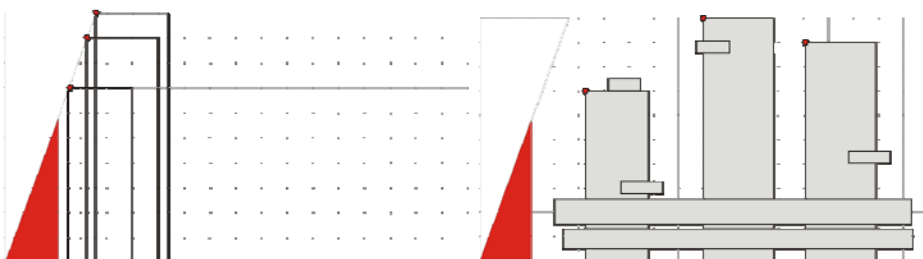


Fig. 9 The scheme of the angular harmony solution at angle 70°. Source: Copyright of Kuzmych V. I

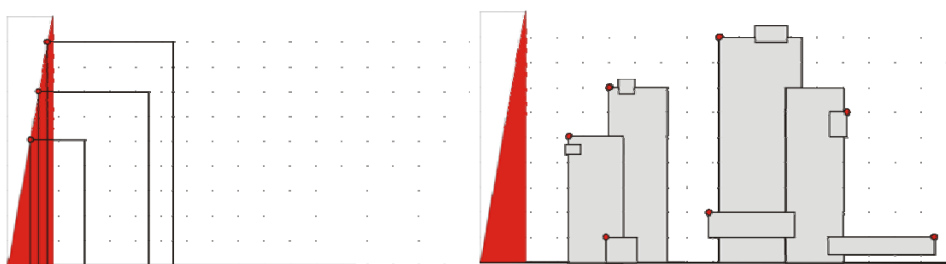


Fig. 10 The scheme of the angular harmony solution at angle 80°. Source: Copyright of Kuzmych V. I

#### 4. CONCLUSION

The proposed methodology combines the aesthetic component of architectural design with normative and planning requirements. The aim is to obtain more qualitative and harmonic design documentation, as the final product of architectural design. The methodology gives the possibility of panoramic wide-format nets of urban architectural compositions perception at low inclination angles in the horizon profile. Spatial coordinate distances between objects will be larger than in vertical aspect ratios. The higher the angle of inclination of vertical constraints, the lower horizontal distances are. Such an approach is typical to modern high buildings, located in densely built-up urban environment, where arises the need of economical use of urban land (Fig.11).

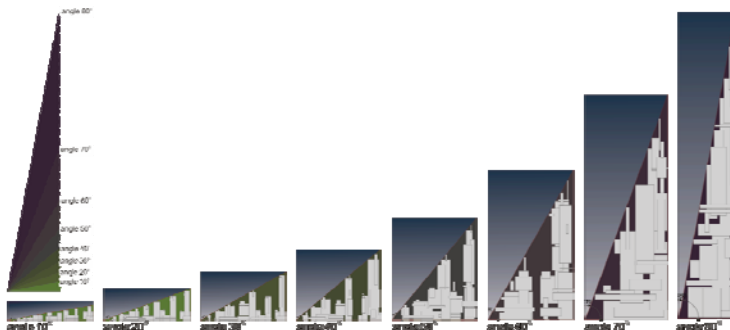


Fig. 11 The scheme of subordination of the laws of corner harmony in architectural design.

The main author's idea is to detect the dependence between the angle of inclination of the inclined line in relation to which the binding of the basic nodal points and the gravitationally constructive horizontal line is carried out. In case of design on a complex relief, the complexity of the landscape with the values of the difference between the horizontal lines is added to the calculation. An analytical approach examines the ratio of projected format from horizontal to vertical with a system of harmonic mass relations between them. Such a methodology for designing architecturally urban sprawl panoramas allows to obtain the maximum effect of an aesthetically harmonious relationship in the professional activity of the architect both at the level of visual-manual application and at the level of the use of computer programs.

#### BIBLIOGRAPHY

- [1] Korotun I.V. Bases of harmonization of architectural environment. KNUBA, 2014, Kyiv,. P. 19-26.
- [2] Smirnov V.M., Budylyna S.M. Physiology of sensory systems and higher nervous activity. Publishing Center "Academy", 2000, Moscow, p. 304.
- [3] Siomka S.V. Forming of method of successive analysis of the systems of chain proportional structures is in architecture. Industrial building and engineering building. 2017, p. 19-27.
- [4] Timokhin V.O., Shebek T.V., Malik T.V. The basis of the design of the subject environment. KNUBA, 2010, Kyiv, p. 400.

#### AUTHOR'S NOTE

The authors **Vasyl Kuzmych, Andrii Pavliv, Juliana Petrovska** is a lecturers at the Department of Design and Fundamental Architecture of the Lviv Polytechnic National University

Kontakt| Contact: kafedra\_doa@ukr.net