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ASSESSMENT INFORMATION HARMONIOUS ARCHITECTURAL FORMS

Abstract. This article discusses the problem of objective estimate the balance of architectural form. Substantiated inconsistency assessment methods based on a statistical model of information. Based on the theory of aesthetic measures developed by the author and Eysenck distinctive information model we propose a method of information estimate the balance of architectural form. In order to quantify the sensory test suggests a simple example of computing a harmony of two squares with the same type of articulations , but with different proportions of elements. The above example confirms that the quantitative evaluation of the sensual . The proposed method has the potential to be used to quantify the harmony of architectural objects , and computer harmonize their size structure .

Keywords: architectural form , harmony , proportionality , information.

Statement of the problem . Identify elements of the proportionality of the dimensional structure of objects of architecture today can be done quite effectively using visually distinctive model of perceived information [1]. However, the overall assessment of a harmonious architectural forms made subjectively , on an intuitive level as at the design stage , and the review and approval of project documentation. Creative intuition is not always a reliable method for assessing the aesthetic quality of the projected objects architecture , especially harmony of their architectural form. This raises the need for an objective assessment of the most important characteristic of the architectural environment

Analysis of recent research . One of the most promising solutions to the problem of objective evaluation of architectural objects is the application of information methods based on the laws of visual perception. However, the vast majority of researchers (M. Benz, A. Moles , D. Birkhoff , V. Bykov, V. Glaser , I. Zuckerman , I. Seredyuk , V. Talkovsky , I. Strautmanis , A. Fomenko , Yu Filip'ev) tried used to assess the aesthetic quality of the two- and three-dimensional objects of mathematical information theory Shannon developed to determine the amount of information in single-channel communication systems.

The wording of the purposes of article . Solve the problem of quantifying the aesthetics of art objects , including architectural, which still remains uncertain.

The main part. Harmony of architectural objects as visually perceived and perceived characteristics of a person should be judged based on the patterns of visual perception. Purely mathematical models, such as probabilistic and statistical, combinatorial, dynamic, etc., are not focused on a man can not be used to assess the aesthetic phenomena. The author of the article was developed distinctiveness information model [1] to identify the proportionality of architectural form and its harmonization.

Since the time of Vitruvius concept of harmony of architectural form was associated with the concept of proportionality. A harmony has been synonymous with beauty . During the Enlightenment, harmony understood as " unity in diversity" . In the early twentieth century . such an interpretation of harmony has been replaced by more precise - " in order of complexity ."

The author of this concept Birkhoff believed that aesthetic measure inversely proportional to complexity. Further research and historical experience showed complete groundlessness of such an understanding of beauty and harmony . Therefore, replacing the concept of Birkhoff came opposite her concept Eysenck : pryamoprortsionalna beauty and complexity and order .

Aesthetic Theory H. Eysenck measures [2] was used for constructing the model of information estimate the balance of architectural form. In 1957, Eysenck proposed a formula for aesthetic measures :

$$M=OxC \qquad (1)$$

where O - ordering facility assessment, C - complexity of the object of aesthetic evaluation.

The basis of the aesthetic concept of Eysenck put psychophysiological premise lies in the fact that the feeling of pleasure (aesthetic comfort) is inversely proportional to the amount of mental energy expended on the perception of the object. Eysenck parcel can be expressed symbolically as follows:

$$Y = f\left(\frac{1}{э}\right), \qquad (2)$$

where Y - the power of aesthetic pleasure ; E - amount of psychic energy spent on the perception of the object of aesthetic evaluation .

Now, to determine a measure of beauty (or harmony) is necessary to determine the physical nature and complexity measure and order. Birkhoff , for example , the complexity determines the number of lines on which placed certain aspects studied them planar geometric compositions. Orderliness in his calculations was derived from the presence of a vertical or horizontal symmetry , equilibrium composition " visual amenity " rotational symmetry and the ability of the display on a rectangular grid coordinates. According to these criteria of each test composition exhibited scores that were summed to form an integrated assessment order. This estimate was highly questionable, because it features such subjective characteristics as "visual amenity " and " balance".

It is not known what criteria determine the complexity and order used Eysenck. It seems that his formula aesthetic measure was empirical, purely conceptual. However, despite the uncertainty of physical complexity and order, beauty and harmony formula Eysenck recognized this, which is consistent with historical practice.

Thus, at the initial stage of formalization harmony of architectural form , you can use the empirical formula of aesthetic measures Eysenck .

The first component of the formula Eysenck complexity perfectly understandable. It has informational nature. The more visual information includes the object of perception, so it is harder and the higher its aesthetic expressiveness. But the object of perception must be as ordered. Orderliness - this quality, the opposite (inverse) of disorder, ie,

$$O = \frac{1}{НУ}, \qquad (3)$$

where NU - quantification is not ordering.

Now Eysenck aesthetic measure will look like this:

$$M = \frac{C}{НУ}, \qquad (4)$$

Disorder of any composition will be determined by the number of relationships between its elements . The more relationships , the greater the disorder. Maximum orderly composition according to this postulate is unity, i.e. , when only a single relation .

Thus, aesthetic measure visually perceived harmony depends on commensurate ordering, because proportionality - this ordering system size characteristics of architectural form in one respect.

As can be seen from the expression (4), the harmony is directly proportional to the complexity (C) (informative) architectural form and inversely proportional to the disorder (NU) architectural form. Informativeness (complexity) can only increase due to the increase of disorder. However , it should be noted , and it is very important that an increase in the complexity of the disorder increases several times faster disorder . Even in difficult compositions, the amount of relationship types dimensional structure is limited to fifty. A informative (complexity) while can reach thousands of pieces of visual information . In the process of further increasing the complexity of the growth disorder stops. As a result of this increase in the informativeness of the architectural form leads to increase its aesthetic value. That is what we are seeing in super styles , for example, in the Rococo or Gothic. So they did not need proportionality. In modern conditions, when architectural form is extremely simple and does not provide the necessary information content for greater aesthetic expressiveness architecture should care about reducing the denominator of the expression (4), ie to minimize dimensional disorder that at minimum complexity (informative) to achieve the desired aesthetic result .

Informativeness of architectural form can be determined by the distinctive information model :

$$U = k\ell g \frac{r_i}{r_j}, [1] \qquad (5)$$

where k - coefficient taking into account the sensitivity of the visual system to perceive differences in the size structure of elements ri and rj; highest sensitivity when C = 1/33 - k = 76,56.

Number of visually perceived information contained in relations between the two dimensional characteristics of the architectural form, called information step.

With the above formula investigate information properties of proportionality. All members of any of the proportional number of units linked relationship:

$$\frac{r_i}{r_j} = p^S, \qquad (6)$$

where p - the basis of proportional number of variables, ie, the ratio of two adjacent members of the series; S - exponent characterizing the mutual arrangement of members proportional series.

Amount of information contained in one of a number of members in proportion with respect to any other member of the same series is equal to:

$$U = k\ell g\frac{r_i}{r_j} = k\ell gp^S = Sk\ell gp, \qquad (7)$$

where S = 1, 2, 3... - integer number of the natural numbers, depending on the relative position in a number of elements, p and k - const proportional part series.

Consequently, k ℓ gp - const for any number of proportional values and its information module is μ.

Dimensional structure of the architectural elements of the form are all dimensions of architectural articulation that form the composite structure and its carriers are visually perceived information , for example, the width and height of the window opening , and sizes interkolumny column width partition , etc.

If in the course of the study of architectural form by using the above given information model information obtained steps multiple modulo certain information (eg , information steps 10 , 20, 30 Elior multiples Information module μ = 10 Elior) , it indicates that the size structure of membership of elements forming these information steps one proportional number of units with base p = 1.35 .

The magnitude of information module information regarding the steps that it binds to characterize their information integrity. If we take a maximum of unity for one component, it can only be achieved if the steps are equal to the information, i.e., information of the information unit is equal steps, i.e., ui = uj = μij. In this case, the index information Unity (index of proportionality) is defined by the formula:

$$\Pi_C = \frac{2\mu_{ij}}{u_i + u_j}, \quad (8)$$

The same equation will determine the amount of any pairwise proportionality neighboring information taken steps architectural form.

Harmony of architectural form can be quantified if we consider it as sensually perceived phenomenon , in terms of general scientific sense perception. It lies in the fact that any living system to ensure its life tends to consume the maximum amount of information from the external environment at the lowest cost is the accumulated information on the assimilation coming . This is logical, since the development - it is the accumulation of information , and the system will spend more than it receives, it will not develop. Consequently, this progressive sense of information processes in nature reflects the principle of least action .

Principle of least action is considered the ultimate meaning of all physical laws in the various sciences . Sensory perception obeys the laws of physics , as a result of physical and chemical processes occurring in our nervous system under the influence of external stimuli on it . Therefore, knowing that the human body evaluates the incoming information into it from the standpoint of least action , we consider the problem of assessing the proportionality of architectural form through the prism of this principle.

If we consider the perceived visual information as a result of the interaction of information coming into the visual system with information storage rights, the rationality of this interaction, we will be judged by how many of our firmware memory has been used in the process of perception and how much information had one firmware.

In 1912 D. Bancroft gave the following interpretation of the principle of least action for biological systems : "The changes affecting the system (biological) such that they seek to minimize external perturbations order" [3, p 12]. In other words , information processes occur in a biological system so as to maximize the information to streamline the outside world in order to produce the minimum amount of the actions of its perceptions.

Since the information on the accepted interpretation of A. Kolmogorov us , is

" the length of the algorithm of perception" and information modules - individual operations , information linking neighboring steps , the efficiency of perception will be determined by the amount of information per one such operation . This value will reflect the value of the action of the visual system and information ordering composition , ie , the proportionality of the architectural form .

Number of data modules contained in two adjacent steps of information , is a modular capacity sum of these informational steps :

$$E_{Ш} = \frac{u_i + u_j}{\mu_{ij}}, \qquad (9)$$

Modular container composition comprising information m pairs of steps is equal to

$$E_{К} = \sum_{2}^{m} \frac{u_i + u_j}{\mu_{ij}}, \qquad (10)$$

Indicator balance of the composition comprising information m pairs of steps will be:

$$M_{Г} = \frac{\sum_{2}^{m}(u_i + u_j)}{E_{К}}, \qquad (11)$$

Indicator harmony characterizes the strength of the relationship information Unity dimensional structure of the architectural composition . The more severe the information link neighboring information of steps, the smaller the amount of information modules will contain summary information neighboring steps. The more information is necessary on the one information unit , the higher harmony.

If we take the position of A. Kolmogorov that information is an expression of complexity, in the formula (11) in the numerator we obtain complexity . Information integrity of the architectural form is a consequence of its proportionality. Therefore, the total modular capacity in the denominator will characterize the degree of disorder of the architectural form .

Thus , the rate is harmony functions complexity and order of architectural form and can be regarded as information interpretation of the aesthetic measures Eysenck (see 4).

We are sure that there is not an architect who would not want to check their subjective assessment of quantitative or quantitative assessment of the sensual . To perform this test , we present here an example of two squares with the same type of articulations , but with different proportions of elements of the dimensional structure (Fig. 1) .

Beneath them are information fields that allow the reader to make the calculation of a harmony of each square.

We present here the final result: A square - 6.16 Ehler, square B - 8.2 Elior. As you can see, square B. has a higher harmony, which is confirmed by the senses.

Most of the participants of the expert survey, which was asked: "Which square, in terms of visual perception of comfort, you give an aesthetic preference?" - Said in favor of a square B. However, not always in the process of estimating the subjective harmony were obtained adequate results.

In some cases, preference was given to the composition with more dominant, information module two steps in fine-grained information remaining steps and low quantifiable. This suggests the need for further research evaluating the emotional patterns of architectural form.

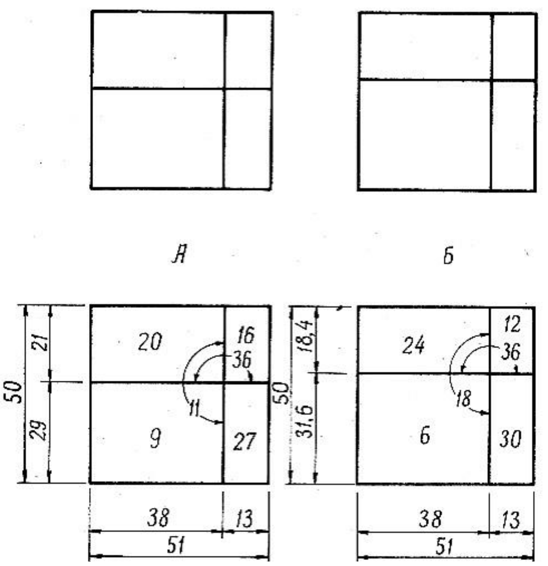

Fig. 1. Dimensional structure and the information field facade compositions

Conclusion. The study provides a solution to the problem quantifying the aesthetic characteristics of the art information on the example estimate the balance of architectural form, which can be used in computer design is to select the optimal alternative design solutions. The advantage of this method is that it is not focused on what or specifically related elements of the structure, which is formed under conditions of functional and structural constraints.

Prospects for further research. Information evaluation harmonious architectural forms in the future can be used in computer-aided design process for selecting the best of several options designed architectural composition of the object. Information method harmonization of architectural form, as in his time Modulor Le Corbusier can become a reliable tool for harmonization across the architectural environment.

Literature

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Анотація

Негай Г.А. Інформаційна оцінка гармонійність архітектурних форм. *У даній статті розглядається проблема об'єктивної оцінки гармонійності архітектурної форми. Обґрунтовано неспроможність методів оцінки , що базуються на статистичній моделі інформації. На основі теорії естетичної міри Айзенка і розробленої автором розрізнювальної інформаційної моделі запропоновано метод інформаційної оцінки гармонійності архітектурної форми. З метою чуттєвої перевірки кількісної оцінки запропонований простий приклад обчислення показника гармонійності двох квадратів з однотипними членуваннями, але з різними співвідношеннями елементів. Наведений приклад підтверджує відповідність кількісної оцінки чуттєвій. Запропонований метод у перспективі може бути використаний як для кількісної оцінки гармонійності архітектурних об'єктів, так для комп'ютерної гармонізації їх розмірної структури.*

Ключові слова: *архітектурна форма, гармонія, співрозмірність, інформація.*

Аннотация.

Негай Г.А. Информационная оценка гармоничность архитектурных форм . *В данной статье рассматривается проблема объективной оценки гармоничности архитектурной формы. Обоснована несостоятельность методов оценки, базирующихся на статистической модели информации. На основе теории эстетической меры Айзенка и разработанной автором различительной информационной модели предложен метод информационной оценки гармоничности архитектурной формы. С целью чувственной проверки количественной оценки предложен простой пример вычисления показателя гармоничности двух квадратов с однотипными членениями, но с различными соотношениями элементов. Приведенный пример подтверждает соответствие количественной оценки чувственной. Предложенный метод в перспективе может быть использован и для количественной оценки гармоничности архитектурных объектов, и для компьютерной гармонизации их размерной структуры.*

Ключевые слова: *архитектурная форма, гармония, соразмерность, информация.*