GEOMETRICAL FUNDAMENTALS OF ACONSTRUCTING IMAGES IN THE MIRROR-IMAGING PLANE

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Summary. **This paper proposes a method for constructing the deformation of objects reflected in the mirror. The effect of changing the position of the viewer and viewpoints on the visibility of objects and on distortion of their shape is examined.**

Keywords: **mirror plane change of the viewer, deformation of objects, shape distortion.**

Formulation of the problem. Approach to creating by architect of the new object concept is systemic and includes a number of important steps, which contain the definition tectonics of designed, that is construction expression through materials and perception of its constituents as a whole object.

Architectural design includes the comparison development of space-planning variants of decisions. At this stage manipulation of primary cells, such as defining orientations on the plan, the composition forms a division into segments and selection of key materials are possible. For clear final result, from the point of aesthetics view, the software is used, with help of which a spatial model is created. Possibilities to make substantial changes are discussed and carried before the stage of selected option verification for compliance with important constraint, which is the final stage. The practice of conducted analysis [3] shows that the levels of achieving compliance of model quality indices and real numbers during the architectural sites operation have significant differences.

Analysis of recent research. This paper analyzes the work of perspective painting, the degree forms depicted deformation determined on the perspective plafond by term calculation viewpoints and different from the calculated, from calculation viewpoints and different from the settlement, which is similar to the study. The difference is in the definition of distortion in the dynamic system of perception.

In the paper [5] is analyzed the environment reflection in the objects with reflections properties, their symmetrical shapes formation during the viewer perception from the different points. Deformation variants of reflected environment in different objects with different degrees and different reflection plane are not discussed.

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The wording of the purposes of the article. The problems associated with mirrored constructions can be divided into two types: a) tasks on building reflections in a mirror; b) the task on building course reflected rays. We are interested in the first type, as in architectural practice are enough examples of objects with reflecting materials, but their properties are poorly studied [2]. In this paper, the aim is to determine the degree of reflections distortion during the perception from different points.

Main part. With the help of established [4] geometrical method of research of distortion in perception plafond image can be found deformation in the perception of architectural objects with mirrored facades.

If you add to the "subject-spectator" another component - the mirror, proportional multiplication of space happens. The interaction of the system depends on the components, because changing the point of view position change occurs of the object visibility and its reflection.

The process of human's perception is dynamic, during the perception of mirror reflections on the facades of architectural objects we can see dynamic deformation of objects and the environment. This process can be studied not only in nature but also in theory.

To determine the patterns of distortions, we take the perspective and horizontal projections system (Fig. 1) [1]. In this perspective is built of the parallelepiped projection height h counting upon viewpoint S, located at a distance d. Changing the view S_1 at a distance d_1 visibility changes sides and faces of the parallelepiped. Built in the mirror reflections give the same picture on the horizontal projection, difference is only in the orientation of parallelepiped.

From this figure we will make the following observations, that from the point S visibility of the object in the mirror for the viewer, standing on one axis with the object, is minimal or even absent depending on the height of the viewer and the subject. By changing the position of the object changes the visibility and becomes visible reflection in the mirror.

The shape of subject is a constant for perception, but from the point of geometric design it is variable. Let us determine how the shape of parallelepiped compared to the image for points of S and S_1 changes.

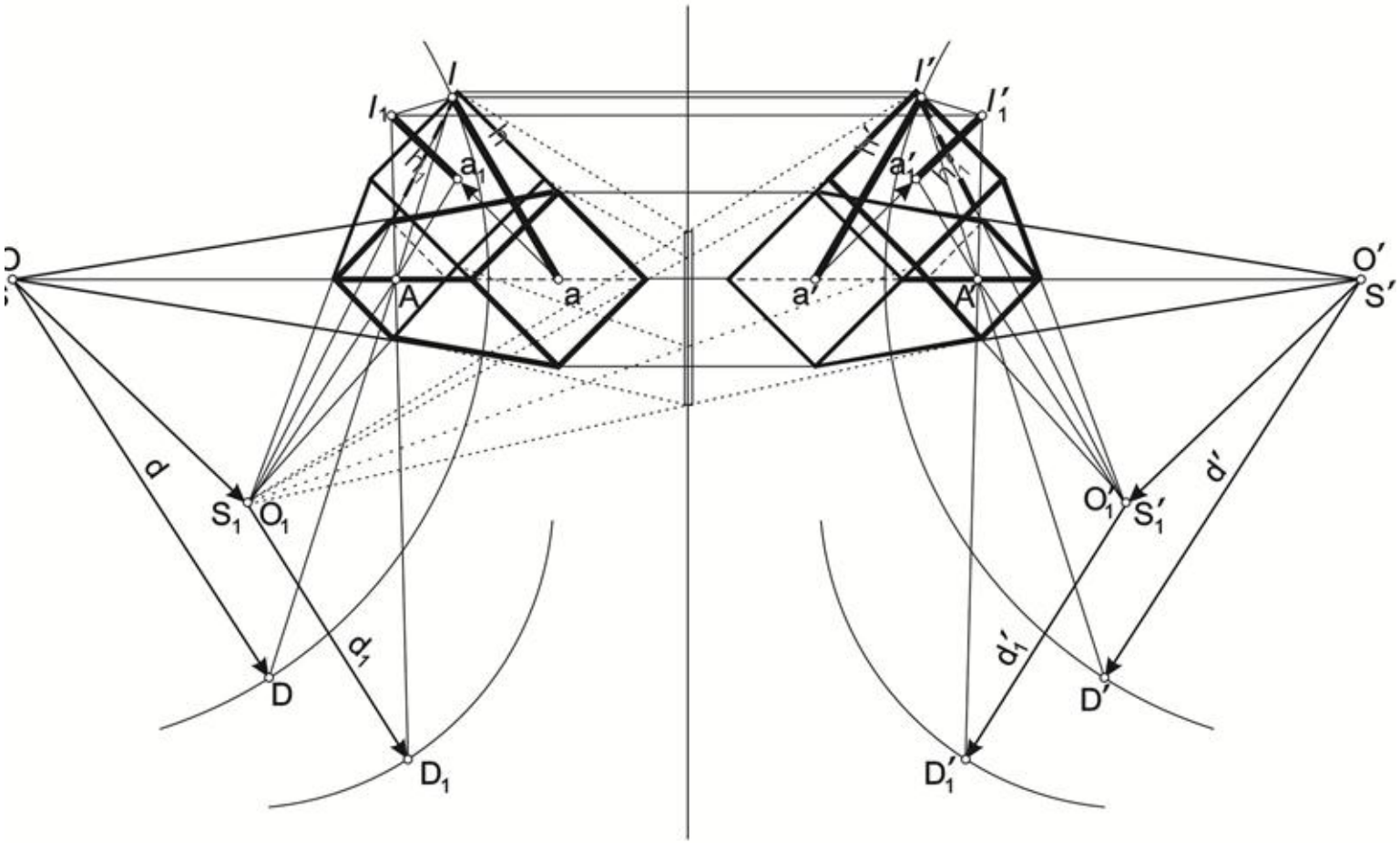

Fig. 1. Building parallelepiped visibility in the mirror during the position change and determination deformation of the object.

Direction of parallelepiped edges should be parallel the optic ray $S_1 O$. The base of object remains unchanged centered at *A*. The upper part of the object at a point a_1 is the result of crossing beam of rays S_1, which pass through perspective points with a beam of parallel rays $S_1 O$ lines, which in turn passes through the horizontal projection points with a basis point *A*.

On the horizontal projection of parallelepiped for a point of view S_1 occurred movement of the upper base in relation to the direction to the bottom in the opposite direction of movement point of view, but the size of the upper fundamentals remained unchanged. Knowing new distance of perspective, by remote point D_1 define the height h_1. Note that with help of decrease in visual distance there was a decrease height of parallelepiped.

Changing the heights of the object is directly proportional to the change of the main visual distance. This ratio is set based on similarity of triangles:

$$\Delta ODA \infty \Delta AIa, \Delta OO_1A \infty \Delta aa_1A, \Delta O_1D_1A \infty \Delta Aa_1I_1.$$

So:

$$\frac{OD}{a_1} = \frac{OA}{Aa} = \frac{O_1A}{Aa_1} = \frac{O_1D_1}{a_1I_1}; \quad \frac{OD}{Ia} = \frac{O_1D_1}{a_1I_1} \text{ or } \frac{OD}{h} = \frac{O_1D_1}{h_1}.$$

In the mirror part of perspective-horizontal projection occurs proportional change of parallelepiped heights, with the change of orientation. A geometric properties and patterns with changes of height observed the same.

Conclusions. As a result of theoretical and practical studies of perception differences are identified. In further research is planned to determine the degree of deviation of vertical height, and coefficient distortion of objects reflected in the mirror.

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