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About one way to choose the optimal type of axonometric projection using shadows

Abstract: *The article has developed a method for choosing the best type of rectangular axonometric projection by a graphical method using the construction of shadows on views.*
Keywords*: axonometric projections, rectangular isometric projection, rectangular dimetric projection.*

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In engineering graphics, when performing graphic work, questions often arise about choosing the optimal or best axonometric projection. By the best kind of axonometric projection, we mean such axonometry, in which the detail can be shown as informatively as possible, i.e. the visibility of holes or some elements. For example, Figure 1 shows a layout from a group of geometric bodies, including: at the base of the prism 1, a non-through hole of the prismatic shape 2 on the upper base of the prism 1, a cylinder 3 and a prism 4 located on the upper base of the prism 1, as well as a non-through hole of the prismatic shape 5 located on the front of the prism 1.

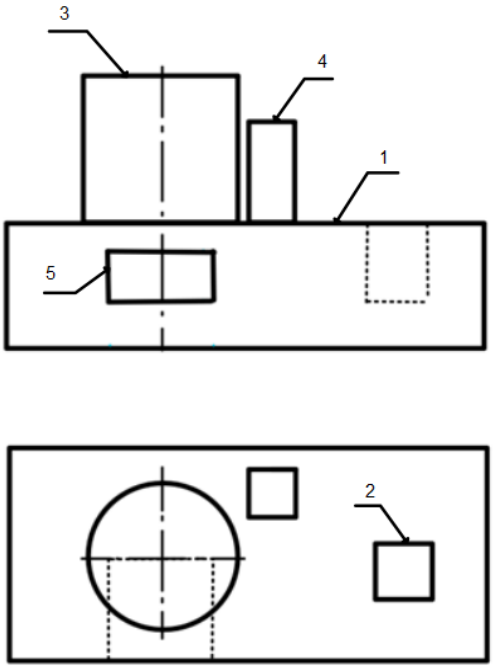


Figure 1: Layout of a group of geometric bodies (main view, top view)

Our task is to determine the visible and invisible elements of this layout from geometric bodies in a rectangular axonometric projection (rectangular isometry and rectangular dimetry). To determine the visibility and invisibility of the elements of the presented layout, we use the construction of shadows on the views, i.e. those elements that are located in the shadow part will not be visible in the axonometric projection. To solve this problem, we need to find the values of the angles of incidence of the rays for each rectangular axonometric projection.

Consider a rectangular isometric projection. We know that the axes in a rectangular isometric projection are located relative to each other at an angle of 1200 and the distortion coefficient along the axes is equal to *x=1*, *y=1*, *z=1* [1, 2]. The apparatus for obtaining rectangular isometry on the example of a cube looks like this. The cube is projected onto the vertical plane Pv, at the same time, if we take into account that we have an orthogonal projection, then the cube and its projection will coincide (Fig. 2). Let's pay attention to the points *A* and *B* located on the vertices of the cube, they are also

in the same projecting ray, i.e. these points are competing. Let's consider this device from the right side (Fig. 3). Points *A* and *B* are in the same projecting beam, perpendicular to the vertical plane *Pv*.

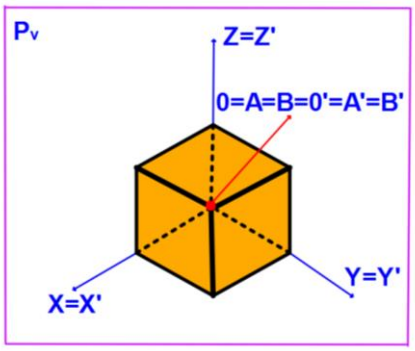


Figure 2: Apparatus for obtaining rectangular isometry

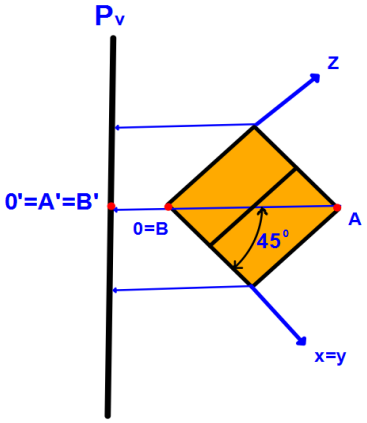


Figure 3: Profile view of the apparatus for obtaining rectangularisometry

Let's build three projections of the cube on the complex drawing (Fig. 4). In the drawing we see that the segment *AB* on the projections of the cube is located relative to the horizontal, frontal and profile plane of the projection at an angle of 450. We can use these angle values to plot light rays when plotting shadows on views.

Let's build shadows on the views for the above layout from a group of geometric bodies (Fig. 1). In Fig. 5, using the values of the angles of the light rays for rectangular isometry, we construct shadows on the views. From the drawing we see that in the shadow part there are: prism 4 (most of it), the bottom of the prismatic hole 2, the bottom of the prismatic hole 5.

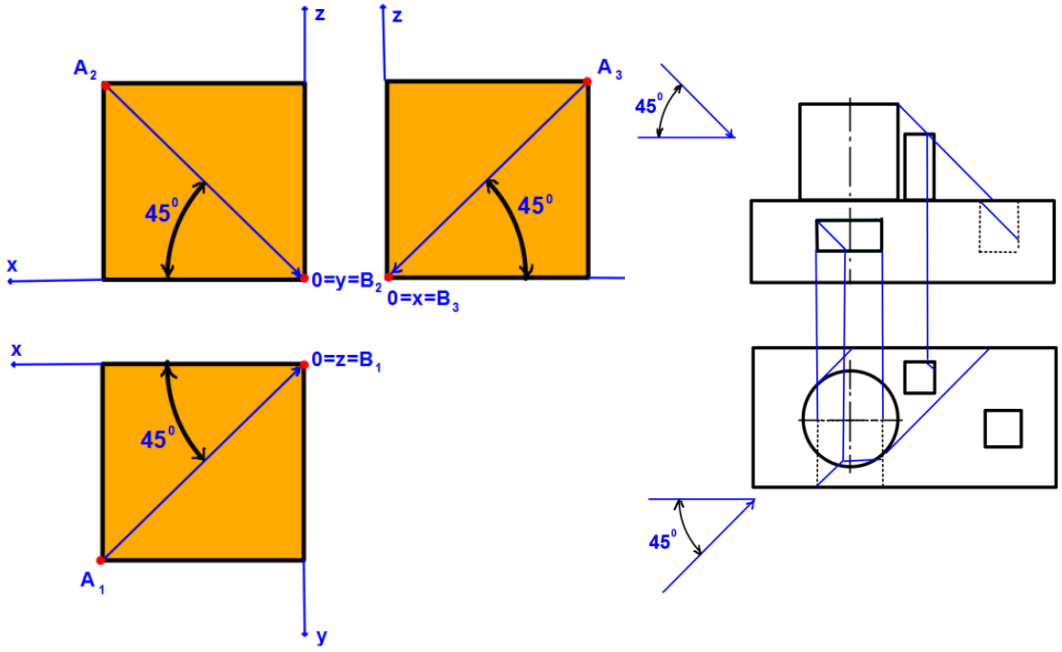


Figure 4: Projections of light rays on a complex drawing

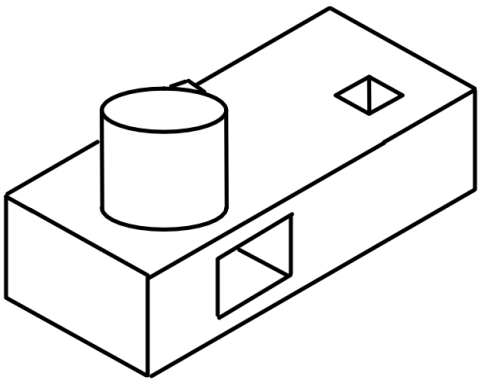


Figure 5: Building shadowsonviews

Let's build an axonometric projection in a rectangular isometry (Fig. 6), where we see that those parts that are located in the shadow are not visible on the axonometric projection.

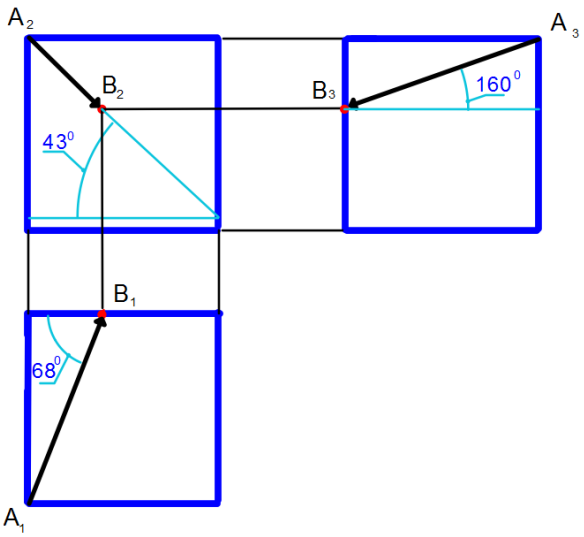


Figure 6: Axonometric projection

Similarly, the values of the angles of the light rays for a rectangular dimetric projection were found (Fig. 7).

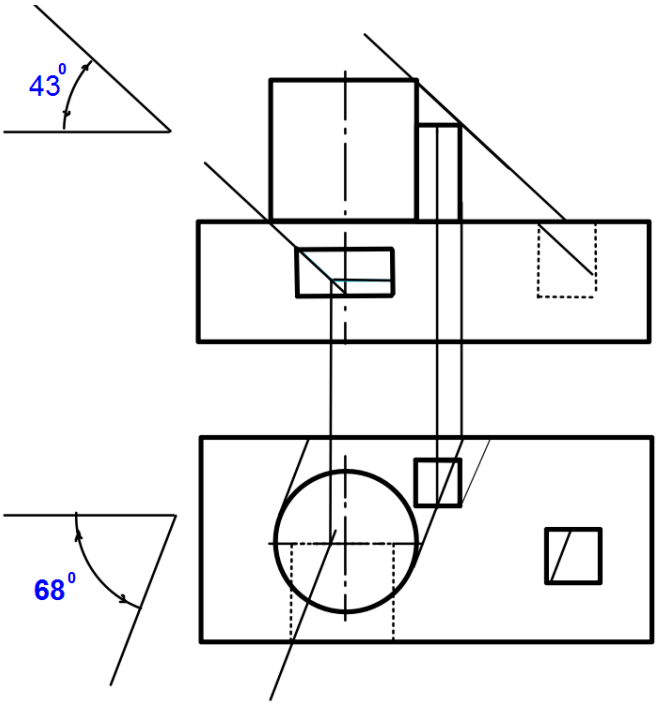


Figure 7: Projections of light rays on rectangular dimetry

Figure 8 shows the construction of shadows on views and axonometric projection in rectangular dimetry.

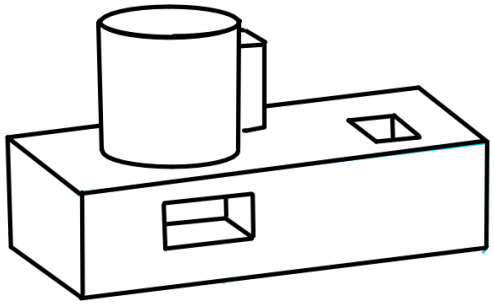


Figure 8: Building shadowsand axonometry

Thus, we graphically found the values of the angles of the light rays for a rectangular axonometric projection. Similarly, it can be found for the oblique axonometric projection. It should be noted that these values of the angles of the light rays can be found analytically with greater accuracy of the angle values.

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Көлеңкелер көмегімен аксонометриялық проекцияның оңтайлы түрін таңдаудың бір әдісі туралы

Аңдатпа: *Мақалада көріністерде көлеңкелер салуды қолдана отырып тік бұрышты аксонометриялық проекцияның ең тиімді түрің таңдауды зерттеп қарастырылған.*
Түйін сөздер*: аксонометриялық проекциялар, тікбұрышты изометриялық проекция, тікбұрышты диметриялық проекция.*

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Об одном способе выбора оптимального вида аксонометрической проекции с помощью теней

Аннотация: *В статье рассмотрен выбор наиболее эффективного вида прямоугольной аксонометрической проекции с использованием наложения теней в сценах.*
Ключевые слова: *аксонометрические проекции, прямоугольная изометрическая проекция, прямоугольная диметрическая проекция.*

Использованная литература

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