

Determination Of General Positions For The Solution Of Geometric Tasks

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Abstract – This paper describes how to solve problems given in the science of descriptive geometry by the method of planes in an arbitrary situation in an optimal form in order to solve them easily and conveniently.

Keywords – Solve Problems, Science Of Descriptive Geometry, Method Of Planes, Arbitrary Situation.

I. INTRODUCTION

The known plane is a two-dimensional geometric figure and is the simplest surface. He divides the space into two parts. The plane is infinite both in a flat image and in a drawing, as in space.

It is known that the aircraft is represented in the drawing in the following 6 forms:

- in the form of three points A, B and C, not lying on one straight line;
- point and in the form of a straight line passing through this point; that is, the plane is represented by the connection of any two of the three points A, B, and C, defined by a straight line.
- two intersections in a straight line; that is, the plane is represented by combining the data points A, B, and C with any two straight lines.
- in the form of a triangle or polygon; that is, these three points A, B and C are formed by connecting them with straight lines.
- in the form of two parallel straight lines; that is, a plane is represented by passing a straight line parallel to one of points A, B, and C to a straight line passing through the other two.
- Planes H, V, W are represented by straight lines, traces intersecting with projection planes, i.e. Horizontal-RH, frontal-RV and profiles-RW traces (Table 1).

In pedagogy, the main indicator is the search, finding and practical application of the simplest, most convenient and simple way to solve a problem. In this regard, the determination of the ease with which planes in an arbitrary position in the geometry of the drawing are easily solved and facilitate the solution of problems, leads to a decrease in the number of graphic operations and manipulations.

Therefore, we took the number of graphic manipulations in solving problems as the main criterion for determining the advantage of providing aircraft in one form or another. After all, it is natural that the less manipulations, the more time it takes to solve the tasks.

The following graph was used as a singular manipulation:

- create a single projection of a point by coordinates, i.e. make a horizontal or frontal projection of a point;
- Draw a connecting line to make the missing projection of the selected point on a geometric figure or object;
- determination of a point lying on a line based on a given condition or at a certain distance from one end;
- section, circle or circular arc;
- find the point of intersection of two straight lines (intersection, circle or arc of a circle);

Now let's solve a problem with the same condition based on this technique, for example, the problem of determining the distance between a point and an arbitrary plane. Then we take planes in an arbitrary position in different views (Figures 1, 2 and 3).

The triangular plane ABC shown in Figure 1 can be thought of as a plane passing through points A, B and C, or a straight line passing through points A and BC, or as two intersecting straight lines AB and BC. Thus, this example is another example of representing three, that is, four arbitrary planes.

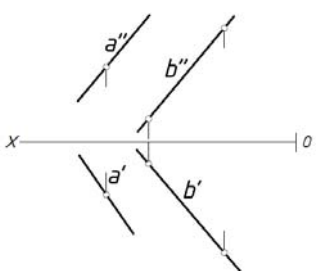
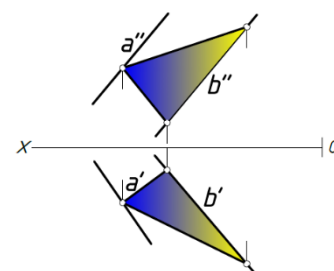
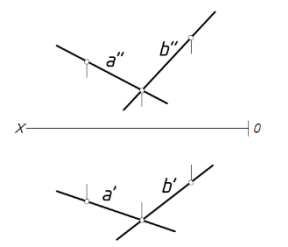
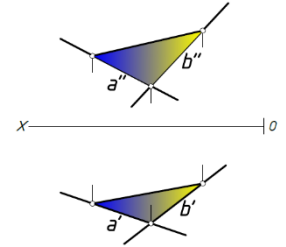
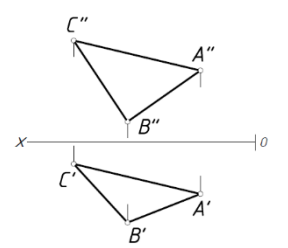
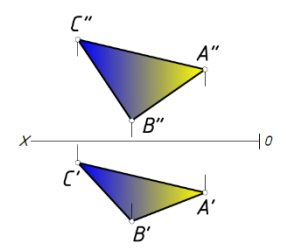
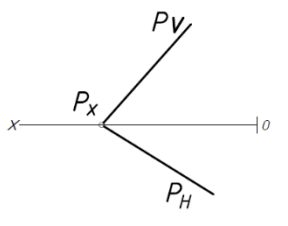
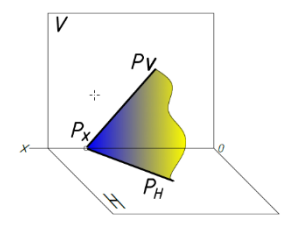
In Figure 2, an arbitrary plane is represented by two parallel planes.

In Figure 3, an arbitrary plane is represented by horizontal and profile traces.

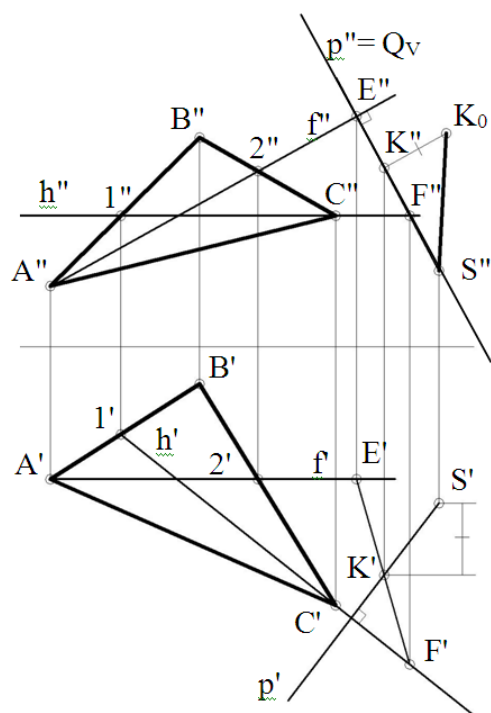
Table 2 shows the number of manipulations performed in solving this problem, using the representation of an arbitrary plane in 6 different ways. This problem is also solved by bringing an arbitrary plane in the form of two intersecting horizontal and frontal straight lines, Fig. 4.

Table 1

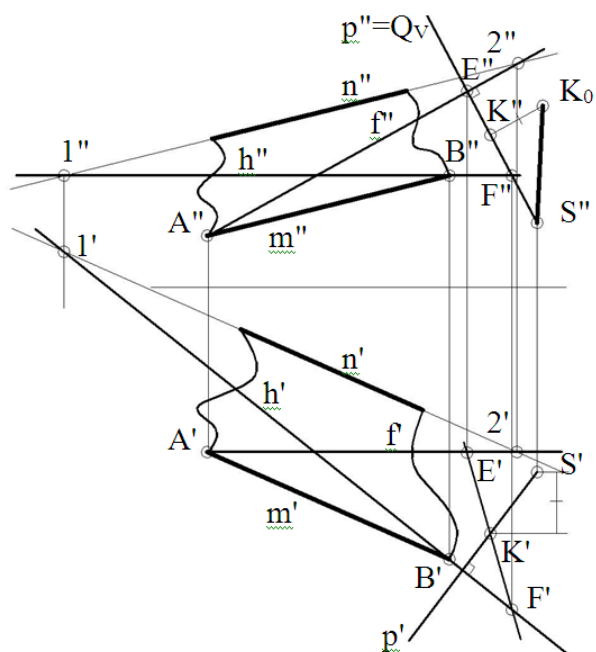
1.		
2.		

3.		
4.		
5.		
6.		

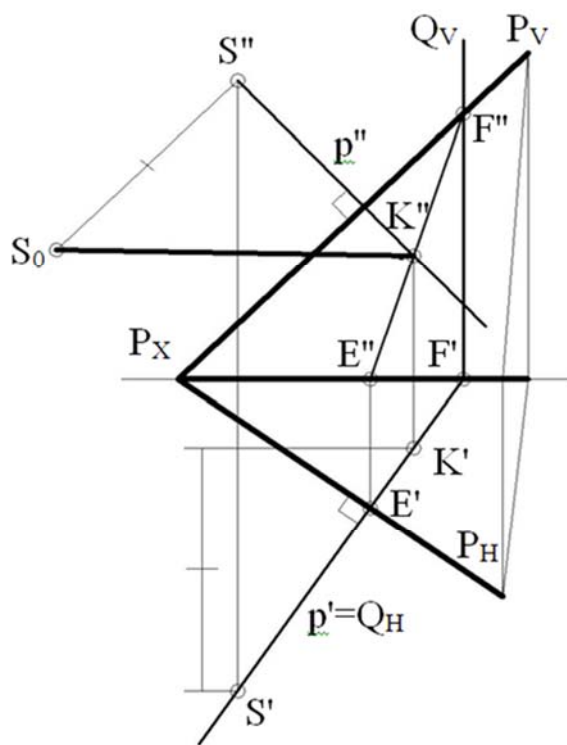
The number of manipulations given in Table 2, i.e., The analysis of the number of graphic operations performed when solving a problem in different angles of the plane in an arbitrary situation is given by traces of an arbitrary plane or by intersecting horizontal and frontal lines.



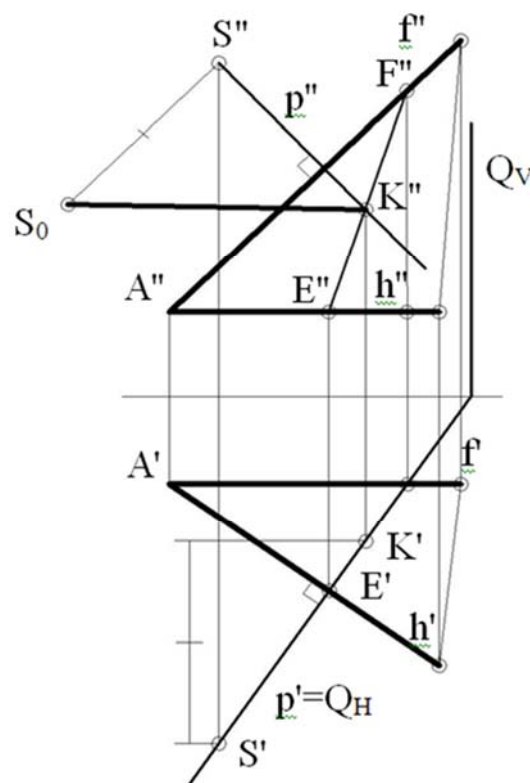
1- figure



2- figure



3- figure



4- figure

This is because the number of manipulators in this view is 9 less than in the triangular view, which is 33% less.

For comparison, the arbitrary planes obtained in the form of a triangle, and the arbitrary planes given in the remaining forms 1, 2, and 3, were reduced to a triangular form in solving the task.

Table 2

A view of the plane transfer in an arbitrary situation	Number of graphic manipulations
In the form of three dots that do not lie in a straight line	30
In the form of a point and a straight line that does not pass through that point	29
The two intersections are in the form of a straight line	28
In the form of two parallel straight lines	29
In the form of a triangle	27
H, V, W in the form of straight lines-horizontal and frontal traces intersecting with the planes of projections	18
The two intersections are in the form of horizontal and frontal straight lines	18

Thus, our research to determine whether an arbitrary plane can be given in different forms, easy and convenient to solve problems, is that it is best to give it with traces or with intersecting horizontal and frontal lines.

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