MODELING IDEAS FOR RULED SURFACES AND THEIR IMPLEMENTATION IN APPLIED GEOMETRY

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Abstract: The study provides theoretical and applied issues related to the establishment of interdisciplinary relations between different disciplines. An algorithm for geometric modeling of ruled surfaces is presented. New geometric configurations have been obtained, due to the mutual introduction of the foundations of technology and geometry.

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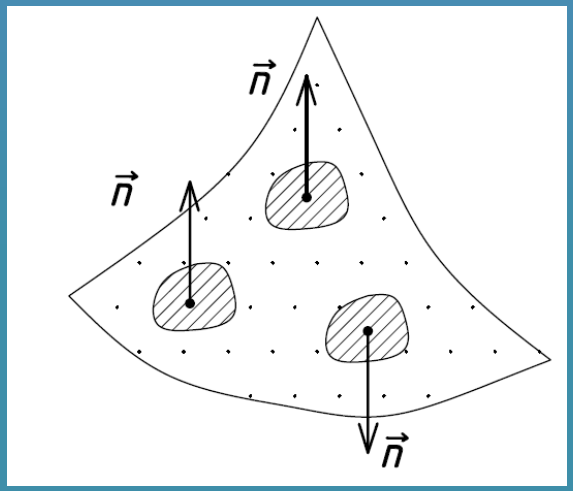
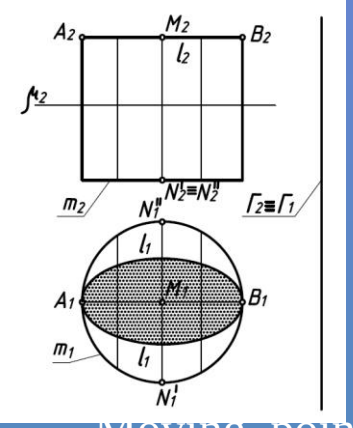
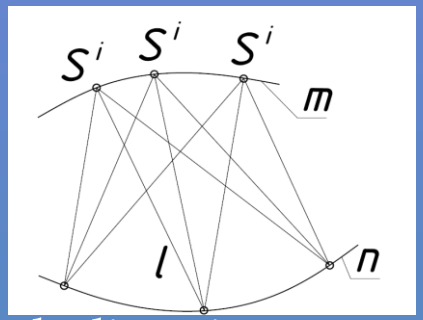
We introduce into consideration ruled surfaces, which are successfully used in various fields of science and technology, including in the design of various types of aircraft.

In the common case, a general ruled surface is a surface formed by some regular movement of a straight (generatrix) line along three guides *F (a, b, c)*. Since in the definition of these surfaces the leading role belongs to the arrangement of the generators, it is expedient here to consider some of them, which are necessary for the construction of the properties. In this case, congruences of lines are used, by which we mean a family of lines depending on two parameters.

Geometrically, it looks like this. Let some surface *F*, having a tangent plane *T* at each point, be given. Then through each point of contact we can draw a normal *n* (perpendicular to the surface *F*). Normal to surface F:







Straight lines in congruence

Moving point *S* along the curve *m*, we can get a set of conical surfaces of general appearance with a common guide *n*. The generators of these surfaces fill a certain area (compartment) of space. The collection of these lines is a two-parameter set. An arbitrary line in this congruence is defined by the curves *m* and *n*.

This implies another definition: set of all straight lines intersecting two predetermined curves is a two-parameter set, i.e. congruence.

Such constructions are successfully used in the practice of designing specific technical surfaces.

If we add to the already known curves *AB* and *CD* some additional curve *EF*, the proposed algorithm covers three possible cases:

1) *EF* lies inside the congruence [*AB, CD*];

2) *EF* is partially included in the congruence;

3) *EF* is located outside the congruence [*AB, CD*].

In the first case, *EF* curve defines congruence, and a single ruled surface is selected within it. In the second case, accordingly, a certain area (compartment) of the ruled surface is defined. In the third case, the ruled surface is not defined.

Thus, as a result of this construction, it is possible to obtain a ruled surface, the generators of which will be based on a priori given arcs a and b. This surface belongs to the class of wedge-shaped surfaces with a twist. From the drawing it follows that line m is a representative of the second series of generators of the base oblique plane.

Thus, the study shows that interdisciplinary connections between geometry and technology allow obtaining new geometric configurations, on the basis of which it is possible to achieve new results in aviation technology.

Thank you for your attention!