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GEOMETRIC MODELING OF THE TORSION SURFACE WITH TWO PARABOLAS, WHICH HAVE COMMON AXIS, BUT LIE IN INTERSECTING PLANES UNDER THE BN-CALCULUS APPARATUS

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Article describes the way of geometric modeling of the torsion surface with two parabolas, which have common axis, but lie in intersecting planes by means of the BN-calculus apparatus. Also received point equations that define torsion surface with predetermined conditions.

Keywords: torsion surface, parabola, arc curve, BN-calculus, common axis.

Formulation of the problem. Due to the properties that make it possible to scan the surface without folds and tears, torso surface proven in various industries. For research and engineering calculations necessary to have a tool that allows you to quickly and accurately simulate surface.

Formation analytical description of algorithms and design objects is the key to solving the problem of applied geometry. The actual problem is to obtain methods and modeling techniques using apparatus torsos BN-calculus. This will greatly enhance the ability to use them.

Analysis of recent research and publications. Analyzing materials work local scientists, individually marked collection of works Krivoshapko S.M. [1]. The paper provided virtually all possible torsovyh surfaces of vector and parametric form default. However, designing surfaces thus leads to the formation of complex systems of differential equations and trigonometric, which, in turn, costly computational resources.

Importantly dissertation research Balyuby I.G., which helped to create the machine BN-calculus opened up new possibilities in geometric modeling objects [2]. His disciples, namely E.V. Konopatskiy, Davydenko I.P. In [3, 4] has been significantly expanded instrument system. Their scientific achievements made it possible analytical description of curves, which are the basis for constructing various torsovyh surfaces.

Around the theme of the article is to study Nesvidomina V.M. [5] in the construction of complex geometric models, including torsovyh surfaces. This paper was a list of shortcomings methods of synthetic geometry, such as high complexity of the process, manual execution of graphic constructions and lack of precision, which generally slows design models. Elimination of these shortcomings is only possible with the use of

modern information technology.

Forming the article purposes. Build geometric model torsovoyi surface with two parabolas with a common axis, but belong to different planes intersect, and get their analytical description of BN-calculus.

Main part. As the sample surface facilities construction torsovyh BN-calculus was defined parabolic surface generators belonging to the subclass of two flat surfaces directing curves. In general, each of them has a vector form and parametric setting surface.

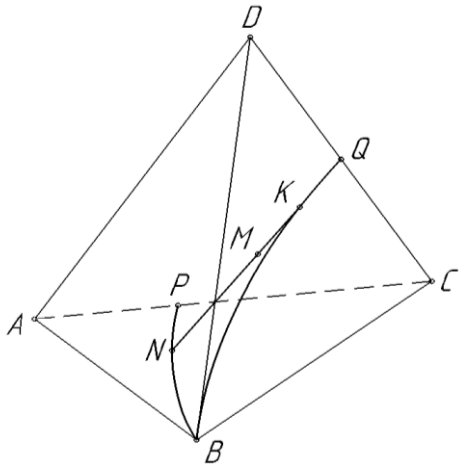

Fig. 1. The geometric layout design torsion surface

Let asked simplex $ABCD$ (fig. 1). According to a geometric algorithm, which was considered in [1], we define the parabola PNB, belonging to the brink ABC, and parabola QKB, belonging to the brink BCD. According to [1], the parabola must belong to two planes intersect. In our case parabola PNB belongs to the plane ABC, a parabola QKB – to the plane BCD, which, in turn, intersect at edge BC, providing the first implementation of the necessary conditions.

The second condition that must necessarily be carried out for this type of surface - the existence of a common axis of both parabolic rails. An example was chosen edge BC a common axis parabolas for PNB and QKB. Define separately each of these parabolas.

In simplex PRS define the parabola PNB as one curve ratio [4] and ask her point following equation:

$$N = P \cdot \bar{u}^2 + 2R \cdot u \cdot \bar{u} + S \cdot u^2. \qquad (1)$$

Define the point P a middle segment AC simplex ABC, so $P = \frac{A+C}{2}$. According to the geometric properties of the parabola point C a middle segment PS, so $C = \frac{P+S}{2}$, from here $S = 2 \cdot C - P$. Point B the median is the midpoint RC, so $B = \frac{R+C}{2}$, from here $R = 2 \cdot B - C$.

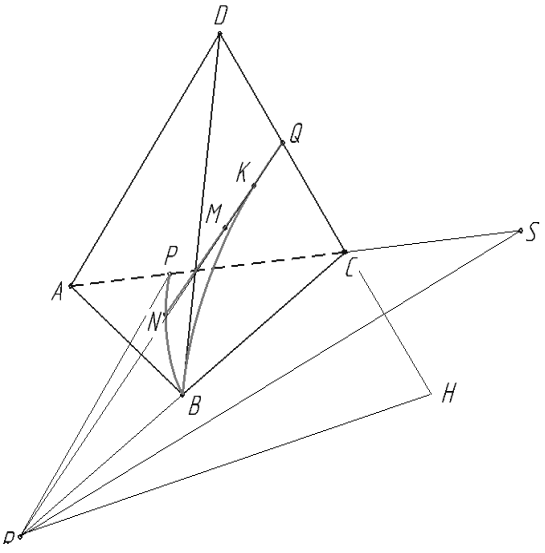

Fig. 2. Geometric design scheme parabola arc

After transformations we obtain: $P=\frac{A+C}{2}$, $S=\frac{3C-A}{2}$, $R=2B-C$.

Substitute value points P, R and S in equation (1):

$$N=\left[\frac{A+C}{2}\right]\bar{u}^2+2\left[2B-C\right]\bar{u}\bar{u}+\left[\frac{3C-A}{2}\right]u^2. \quad (2)$$

After transformation we get:

$$N=A\frac{1-2u}{2}+4Bu\bar{u}+C\frac{1-6u+8u^2}{2}. \quad (3)$$

Similarly, we define the equation for the parabola QKB in simplex QRH:

$$K=D\frac{1-2u}{2}+4Bu\bar{u}+C\frac{1-6u+8u^2}{2}. \quad (4)$$

Equation generatrix torsovoyi surface is defined as the equation of the line:

$$M=N\cdot v+K\cdot\bar{v}. \quad (5)$$

Substituting equation (3) and (4) in equation (5) and after transformations we obtain:

$$M=A\frac{1-2u}{2}\bar{v}+4Bu\bar{u}+C\frac{1-6u+8u^2}{2}+D\frac{1-2u}{2}v. \quad (6)$$

Представимо точкове рівняння (6) у параметричному вигляді:

$$\begin{aligned}
x_M &= x_A\frac{1-2u}{2}\bar{v}+4x_Bu\bar{u}+x_C\frac{1-6u+8u^2}{2}+x_D\frac{1-2u}{2}v,\\
y_M &= y_A\frac{1-2u}{2}\bar{v}+4y_Bu\bar{u}+y_C\frac{1-6u+8u^2}{2}+y_D\frac{1-2u}{2}v, \quad (7)\\
z_M &= z_A\frac{1-2u}{2}\bar{v}+4z_Bu\bar{u}+z_C\frac{1-6u+8u^2}{2}+z_D\frac{1-2u}{2}v.
\end{aligned}$$

The result of the equation (6) shown in Fig. 3.

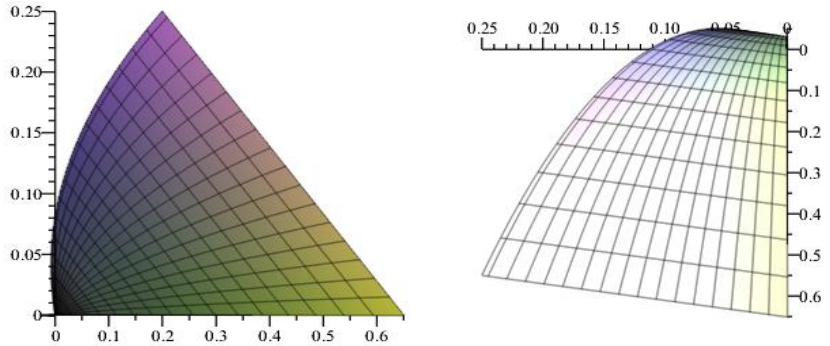

Figure 3. Torsion surface with two parabolas with a common axis, but are planes that intersect

Conclusions. Constructed geometric model torsovoyi surface with two parabolas with a common axis, but are planes that intersect, and formed their analytical description of the BN-calculus. The resulting point equation expanded instrument system BN-calculus can be considered and applied problems related to the type specified in sex torsovoyi surface. In future it is planned to investigate the class torsovyh two flat surfaces with curved rails and related problems of applied nature.

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