УДК 514.18

THE DOT DEFINITION OF ELLIPSE AXIS OF WHICH IS LOCATED UNDER CORNER TO LINE OF GENERAL AND EXAMPLES OF HIS APPLICATION

I. Davydenko, T. Malutina, J. Starchenko

Summary. In work the dot definition of ellipse the axis of which is located under a corner to the line of general is in-process got, on the basis of graphic algorithm of his construction, by the methods of BN-calculation (the dot calculation of Balyuby-Naydysha). The examples of point task of curvilinear surfaces of technical forms are resulted, on the basis of MMS (method of mobile simplex), with formative as a parabola and sending as an ellipse.

Key words: **the dot definition of ellipse, corner to the line of general, BN-calculation, method of mobile simplex.**

Formulation of the problem. Building curved surfaces technical forms as a guide surface take an ellipse, and the generatrix is a parabola. In the dot calculus [1,2] is already developed point equations data curves in the different parameterisations [3], however, necessitated the assignment of the point equation of the ellipse whose axis is at an angle to direct the general provisions to specify a guide surface technical forms (support contour of the shell) in the plane in general position.

Analysis of recent researches and publications. In recent studies point equations of the second order curves in the different parameterisations were developed [3].

The objectives of the article. The purpose of this paper is to get the point of equation of ellipse whose axis are at an angle to direct the general provisions for further defining surfaces of the shells with the reference loop in the plane of the general provisions [4].

The main part. Using the polar parameterization of the plane we define the point equation of the ellipse in the simplex of points of the ICA when using the parameter of angle (Fig. 1). Let the radius of the circle and corresponds to the semimajor axis of the ellipse then corresponds to the minor radius of the ellipse:

$$M = (A - C)\cos\varphi + (B - C)\sin\varphi + C, \quad (1)$$

where $\varphi \in [0;2\pi]$ – the angle of compression (stretching) that determines the current point M of the ellipse with the full bypass line curve.

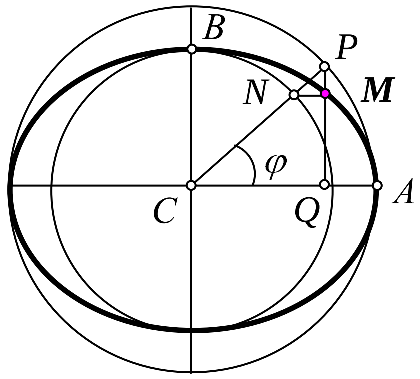

Fig. 1. Setting of an ellipse grip circumference

Override point equation of the ellipse in the simplex of points of the BCA with cent, rod / CP=m, CQ=n (Fig. 2), while the semimajor axis of the CP forms with the line AB an angle θ.

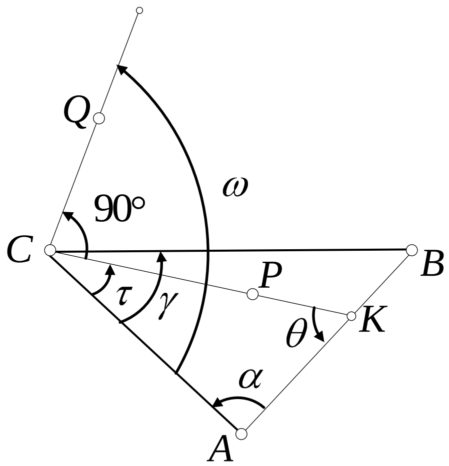

Fig. 2. Setting of an ellipse whose axis is at an angle to direct the general provisions

To solve the problem, you need to define points and , under given conditions, and then override the equation of the ellipse (1).

$$M = (P - C)\cos\varphi + (Q - C)\sin\varphi + C. \quad (2)$$

From triangle BCA we define the point P:

$$\frac{AK}{\sin\tau} = \frac{b}{\sin\theta} = \frac{CK}{\sin\alpha} \to AK = \frac{b\sin\tau}{\sin\theta} \to CK = \frac{b\sin\alpha}{\sin\theta} \to \quad (3)$$

$$K = (A - C)(1 - \frac{b\sin\tau}{c\sin\theta}) + (B - C)\frac{b\sin\tau}{c\sin\theta} + C, \quad (4)$$

где $0\le\tau\le\gamma$, $\tau=\pi-\alpha-\theta$, $b=|CA|$, $c=|AB|$.

Then:

$$K=(A-C)\frac{\sin\theta-b\sin(\alpha+\theta)}{c\sin\theta})+(B-C)\frac{b\sin(\alpha+\theta)}{c\sin\theta}+C, \qquad (5)$$

где $\pi-\alpha-\gamma\le\theta\le\pi-\alpha$.

Then we have:

$$P=(K-C)\frac{m}{CK}+C=(A-C)(\frac{m\sin\theta}{b\sin\alpha}-\frac{m\sin(\alpha+\theta)}{c\sin\alpha})+(B-C)\frac{m\sin(\alpha+\theta)}{c\sin\alpha}+C. \qquad (6)$$

From the triangle of the BCA define a point Q:

$$Q=(\dot{A}-C)\frac{n}{b}+C, \qquad (7)$$

where:

$$\dot{A}=\frac{(C-A)a\cos(\gamma+\alpha+\theta)+(C-B)b\cos(\alpha+\theta)}{a\sin\gamma}+C. \qquad (8)$$

Examples of computer visualization of the ellipse are shown in fig. 3.

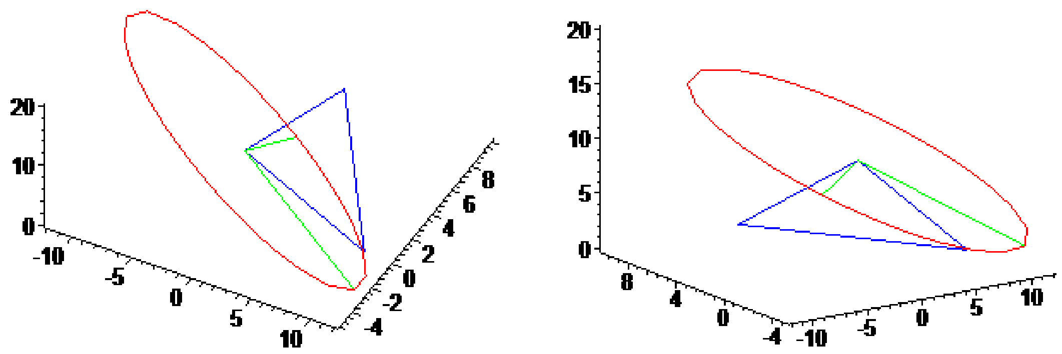

Fig. 3. Examples of computer visualization of the ellipse in the mathematical processor *Maple*

Examples of point assignments for curved surfaces technical forms, based on the method of rolling the simplex with cuts in the form of a parabola and a guide in the form of an ellipse whose axis is at an angle to direct the general position shown in fig. 4 and 5.

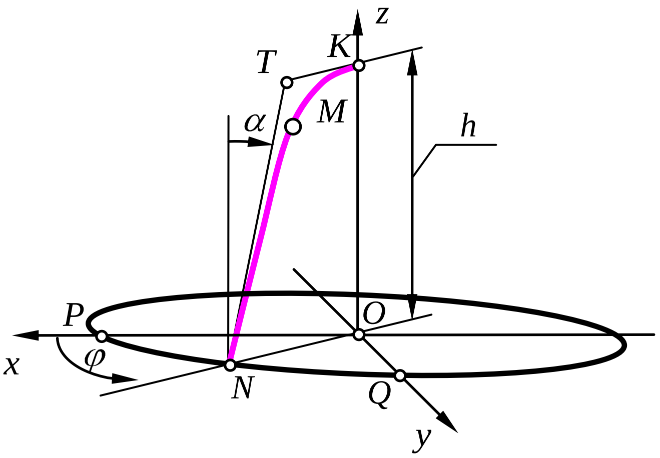

Fig. 4. Scheme for the construction of the shell surface with a support contour in the plane of the general provisions

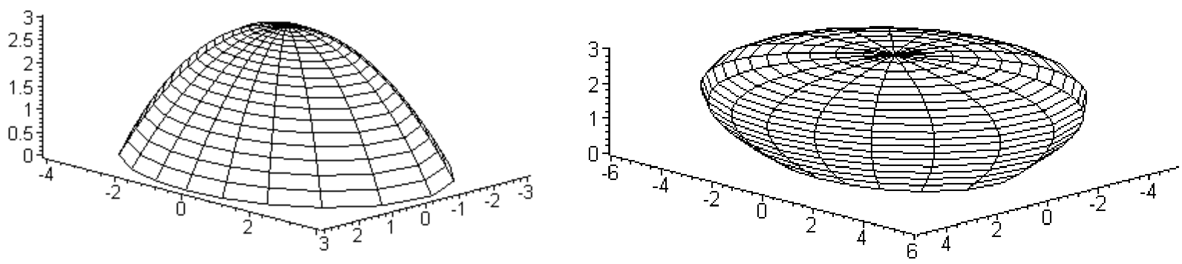

Fig. 5. Examples of computer visualization of the shell surface in the mathematical processor *Maple*

Conclusions. Received point the equation of the ellipse whose axis is at an angle to direct the General provisions for further defining surfaces of the shells with the reference contour in the plane in General position.

Literature

1. Верещага В.М. Алгебра БН-исчисления / В.М. Верещага, И.Г. Балюба, В.М. Найдыш // Прикладна геометрія та інженерна графіка. Міжвідомчий науково-технічний збірник. Вип. 90. – К.: КНУБА, 2012. – С. 210-215.
2. Метод подвижного симплекса при конструировании 2-поверхностей многомерного пространства / [Балюба И.Г., Полищук В.И., Горягин Б.Ф., Малютина Т.П., Давыденко И.П. и другие] // Моделювання та інформаційні технології. Збірник наукових праць. Спец. вип. Матеріали Міжнародної наукової конференції «Моделювання – 2010», 12-14 травня 2010 р., м. Київ, Інститут проблем моделювання в енергетиці ім. Г.Є. Пухова НАН України. – Т.1. – С. 310-318.

3. Давиденко І.П. Точкове задання кривих другого порядку у різноманітній параметризації / І.П. Давиденко // Праці Таврійської державної агротехнічної академії. – Мелітополь: ТДАТА, 2006. – Вип. 4: Прикладна геометрія та інженерна графіка. – Т. 31. – С. 128-132.
4. Давиденко І.П. Точкове задання поверхонь оболонок на різноманітних планах / І.П. Давиденко // Зб. матеріалів Міжнародної українсько-російської науково-практичної конференції «Сучасні проблеми геометричного моделювання». – Харків: Харківський державний університет харчування та торгівлі, 2005. – С. 107-113.