A DECISION OF TASKS OF FORM FORMATION OF TWO-DIMENSIONAL GEOMETRICAL SETS IS IN THREE-DIMENSIONAL SPACE

O. Shoman, V. Danylenko

Summary. **The analysis of problems is conducted in the article, where form formation of geometrics (geometrical sets) in space of the second measuring will be realized through three-dimensional space. Graphic examples of form formation of parallel sets are made. Expediency offered approach is shown near the decision of certain types of problems.**

Keywords: **forming, geometric modeling, parallel sets, curves and surfaces.**

Formulation of the problem. Problem Solving geometric pattern forming families often faced with the complexity of implementing the algorithms if necessary to satisfy the conditions, such as parallelism of geometric elements that have special points or samoperetyny. In addition, there are questions the accuracy and adequacy of the solutions. This solution can be obtain accurate but received geometry objects not meet the requirements of practice. This is important in the field of geometric modeling of heterogeneous processes [1]. Therefore, you must look for ways to solve the problems of forming these objects.

Analysis of recent research. In [2,5] the methods of forming families of curves and surfaces visualization solutions of problems concerning the modeling of heterogeneous processes.

The wording of Article purposes. Identify the types of tasks where appropriate is the implementation of algorithms families forming two-dimensional geometric objects through simulation in three dimensions.

Main part. Geometric interpretation algorithm description of parallel lines with equations can be realized when the equations have the form $t = F(x, y)$, where the function F is chosen on the basis of output curve geometry and properties of parallel lines required level of graphics. This schedule mentioned function F, should coincide with the surface of the same inclination. In each particular problem where you describe the lines in the form of the equation, there will always be additional terms or provisions, which will be elected from a specific set of possible equations. Recall [2], the description of the same class surface tilt and parallel curves families realize the method for solving differential equations in partial eykonala type, method of preparation and solving the normal equation; integrated surface through which the determined family of plane curves -

ekvipotentsiali physical field is a graphic interpretation of the method using elements of the theory of functions of complex variable.

Thus, the family of parallel curves in the plane *z* = 0 in the coordinate system *Oxy* can be constructed as a plurality of sections combined projections of planes *z* = const uniform surface inclination (angle of 45 ° when *a* = 1) [2] that satisfies the equation eykonala:

$$\left(\left|\mathrm{grad}\ z(x,y)\right|\right)^2 \equiv \left(\frac{\partial z(x,y)}{\partial x}\right)^2 + \left(\frac{\partial z(x,y)}{\partial y}\right)^2 = a. \qquad (1)$$

The required integral surface usually ambiguous towards the axis *Oz*, so you should use numerical methods for integrating equation (1) [2]. The exact solution of equation eykonala, integrated visualization of surfaces and parallel curves taken for initial curves that cross themselves or have special terms. Fig. 1 shows the integral surface (eykonala solutions of equations) and family planar curves parallel to the 4-petal Rose $x = 3\cos t \sin 2t$; $y = 3\sin t \sin 2t$ (fig. 1, *a*, *b*); cardioid $x = 2\cos t(1+\sin t)$; $y = 2\sin t(1+\sin t)$ (fig. 1, *c*, *d*); hypocycloid $x = 2\cos t + \cos 2t$; $y = 2\sin t - \sin 2t$ (fig. 1, *e*, *f*).

Since the schedule of normal function [3] - the same surface slope, then forming a family of parallel curves explained similarly. You must make the normal equation. It should be noted that these curves as graphics exponential, logarithmic and other functions, the construction of normal equations associated with solving transcendental equations, which, generally speaking, is not exactly solved. This is the main difficulty describing the process of normal equations for arbitrary curves. However, the problem of constructing an approximate normal equation can be solved for almost any curve approximated with preset accuracy finite number of arcs and segments [2,3]. Fig. 2 graphically presented solutions of normal equations for: a polygon with vertices (-2; 3), (-4; 0), (-2; -3), (3; -4), (3; -1), (5; 3), (1; 1) (fig. 2, *a*, *b*); arc passing through the point with coordinates (4, 6), (3, 8), (11, 1) (fig. 2, *c*, *d*); the system randomly arranged segments (normal function *z* = *F (x, y, t)* at *t* = 120) (Fig. 2, *e*, *f*).

Some images may be the spatial models, preserving geometrical similarity with objects, others serve as iconic symbols and symbolic images. Those of images related to the three-dimensional space must be provided with direct and inverse algorithms transformation space [4].

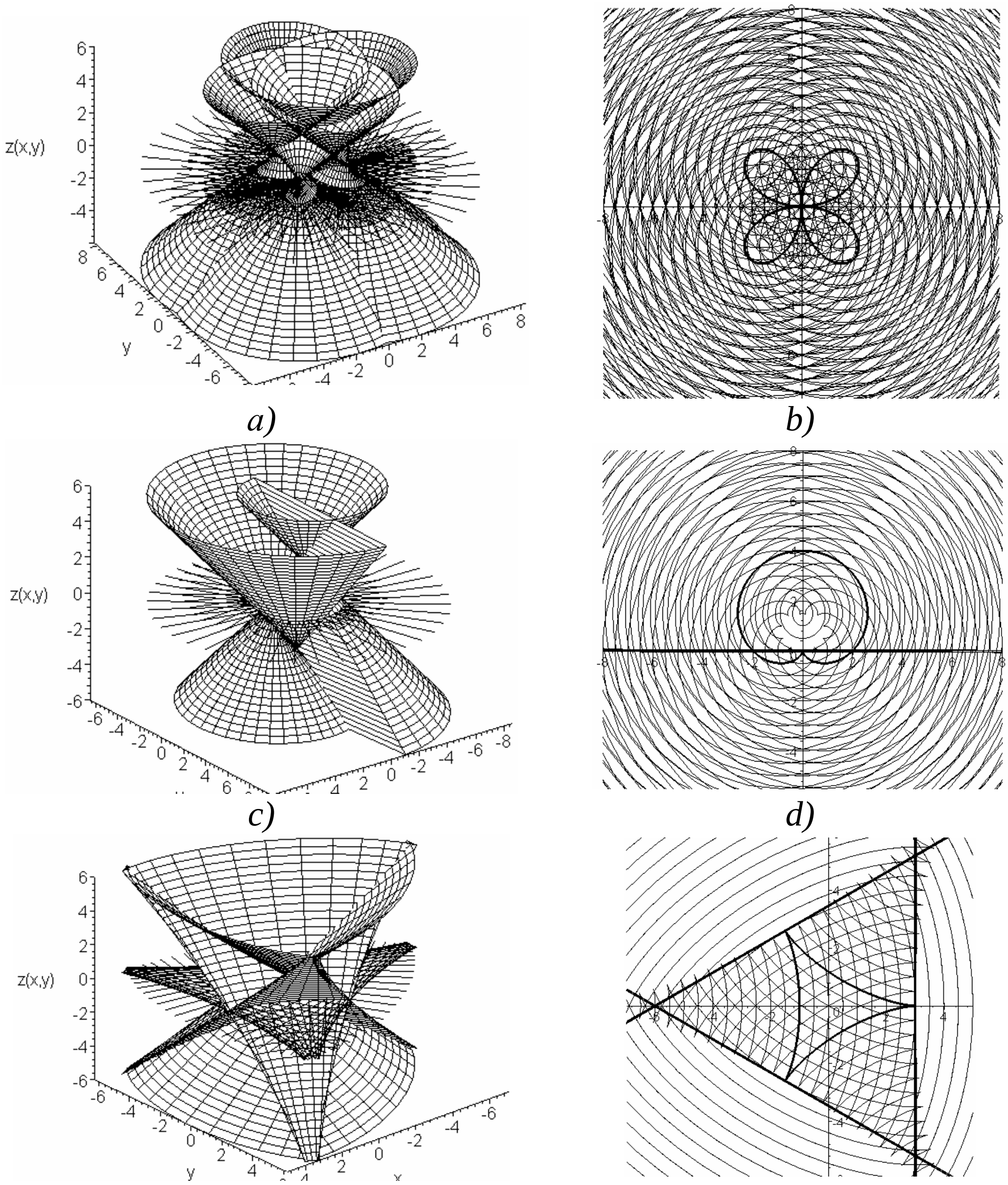

Fig. 1. Solution eykonala equation in problems of forming a family of curves parallel to, *a, b* -chotyrypelyustkovoyi rose; *c, d* - cardioid; *e, f* -hipotsykloyidy.

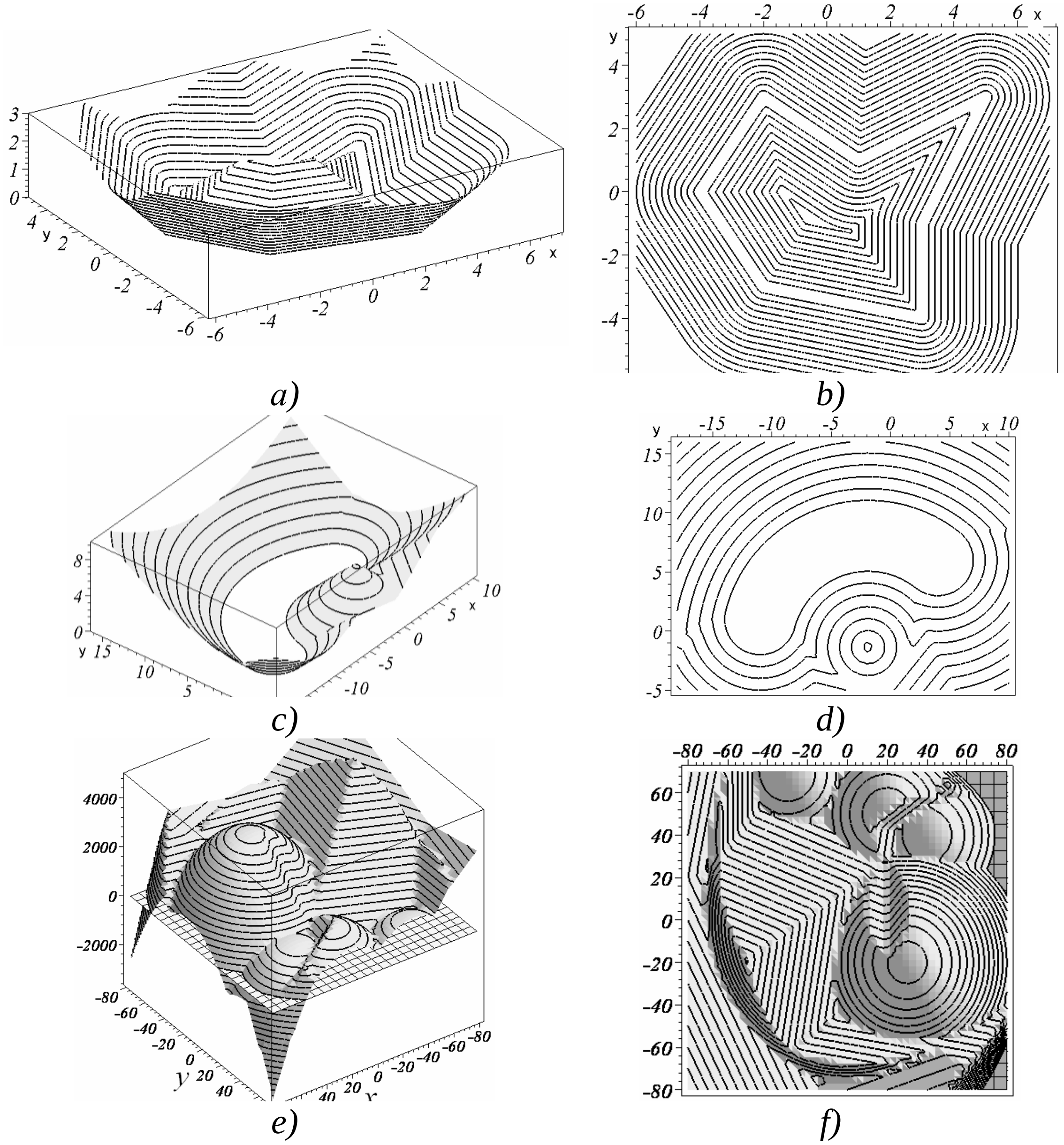

Fig. 2. Solutions using normal functions in problems of forming a family of curves parallel to, *a, b* -bahatokutnyka; *c, d* -duhy circle; *e, f* - randomly spaced intervals.

A good example of a comprehensive transformation of one space to another is a conformal mapping and rendered three-dimensional and two-dimensional solutions [5] boundary problems in the theory of functions of complex variable. Spatial graphs real Re*W(z)* and imaginary Im*W(z)* parts of the complex potential vortex $W(z)=\dfrac{Q+i\Gamma}{2\pi}\ln(z-z_0)$ (where Q – power vortex, H - voltage output) explain [5] power lines forming a vortex centered at z_0. Conformal grid here is a combination of two types of vortex lines of force (clockwise and in the opposite direction). Fig. 3 *a*-*d* at Q = 10 and L = 5 the surface Re*W(z)* and Im*W(z)* and ekvipotentsiali fields and lines jets. Ekvipotentsiali line jets and physical field of complex logarithmic singular points can be considered potential lines of functions, which are descriptions of real and imaginary parts. These properties are used in qualitative analysis of solutions of some boundary problems (Fig. 3, e, f).

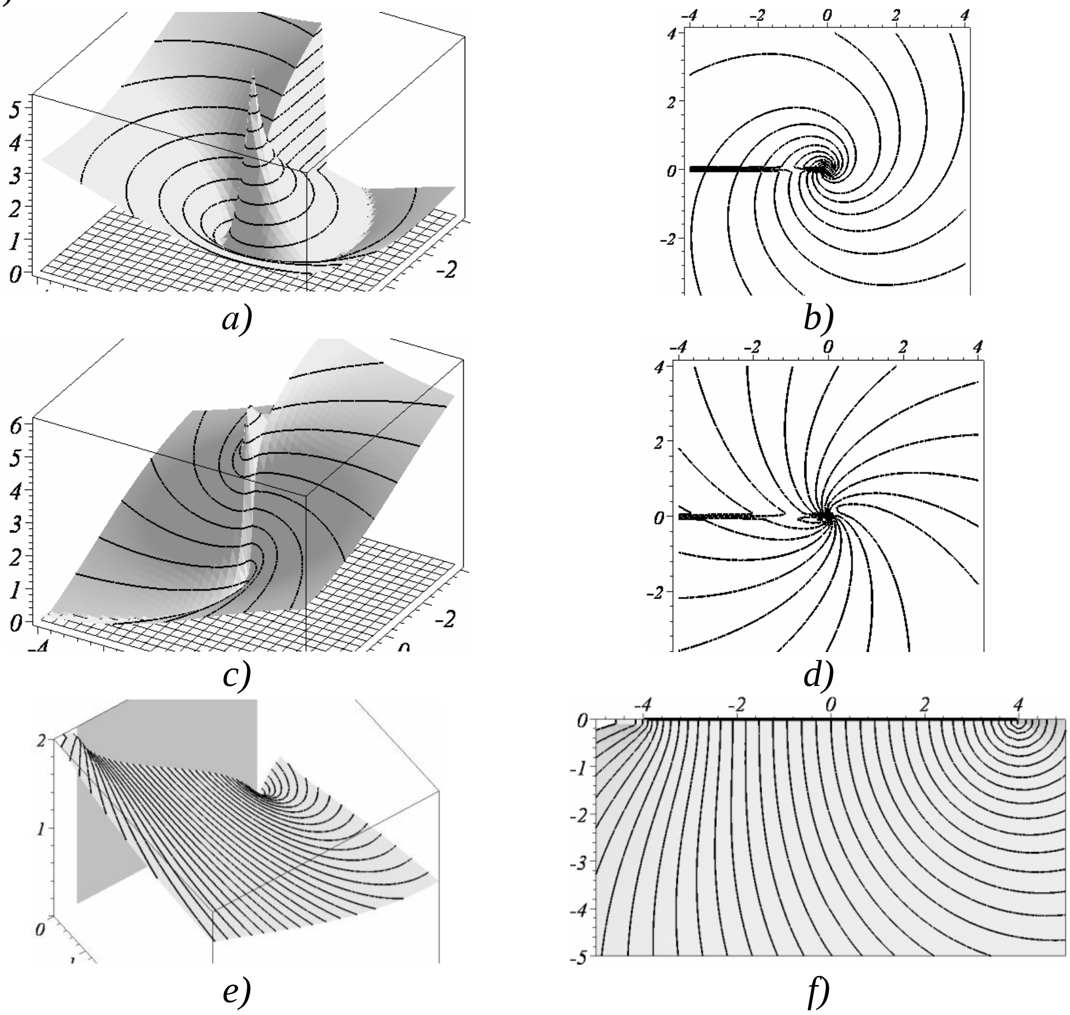

Fig. 3. Solutions using complex analytic functions of potential problems in forming a family of curves*: a, b* - ekvipotentsialey vortex; *c, d* - jet lines; *e, f* - lines of graphic analysis function for modeling physical field.

Conclusions. Problem Solving families forming two-dimensional geometric images by using three-dimensional constructions increased variation. The behavioral integral surfaces is one of the families through the study of two-dimensional objects. For example, since the boundary line real phenomenon or process with complex geometric form, schedule unknown function will be integrated surface obtained by "deforming" the surface of the same inclination. "Deformed" nature of the integrated nature of the surface determines unparallel family of curves regarding real curve.

Literature

1. *Барре П.* Кинетика гетерогенных процессов: пер. с англ./ П. Барре. – М.: Наука, 1970 – 304 с.
2. *Шоман О.В.* Паралельні множини в геометричному моделюванні явищ і процесів : дис... д-ра техн. наук: 05.01.01 / О.В. Шоман. – Харків: НТУ "ХПІ", 2007. – 288 с.
3. *Рвачев В.Л.* Геометрические приложения алгебры логики / В.Л. Рвачов. – К.: Техника, 1967. – 212 с.
4. *Даниленко В.Я.* Розробка алгоритмів лінійних та нелінійних перетворень для зображення об'єктів автомобільних доріг / В.Я. Даниленко // Геометричне та комп'ютерне моделювання. – Харків: ХДУХТ, 2007. – Вип. 18. – С. 203–208.
5. *Куценко Л.М.* Геометричне моделювання силових ліній вихору при розв'язанні задачі фільтрації / Л.М. Куценко, О.В. Шоман // Праці Таврійської державної агротехнологічної академії. – Мелітополь: ТДАТА, 2005. – Вип. 4. – Т. 29. – С. 10–17.