

GEOMETRIC MODELING FOR RELIEF WASTEWATER ENGINEERING PROBLEMS

Abstract. Justified the advantage of choosing the design surface on the basis of structural relief lines in engineering design problems vertical layout.

Keywords: design surface topography, structural lines, lines isochrones.

Statement of the problem. In modern practice of engineering design problems associated with the vertical layout - the transformation of the terrain in the project area (PP) - are conducted on the basis of GIS technologies with different imaging conditions. Meeting the challenges of creating and visualizing digital elevation models (DEM) for use in various engineering purposes on the basis of structural lines (isolines watersheds thalwegs etc.) is relevant.

Analysis of recent research and publications. Under the digital model of a geographic object is understood some form of representation of the initial data and their method of structural description, allowing "compute" (restoring) the object by interpolation or extrapolation approximation [1].

Solve engineering problems associated with vertical layout and sanitation are based on the structural lines of the relief. They carry a variety of information about the quantitative and qualitative characteristics of the terrain. To determine the optimal site boundaries PP known structural lines are insufficient . To solve this problem requires additional structural lines - lines isochrones lines of equal slope . [2] They carry information about the acceleration of material particles on the surface. If deviations in surface regions are uniform , the lines indicate the possibility of isochrones converting this section to the inclined plane and the limits of its admissibility . [3] Obviously, the surface contours are not conducive to the optimal choice of the projected surface , therefore we need a new terrain model is more suitable to select the optimum bandwidth .

Formulation of the objectives of Article : offer terrain model based on structural lines and specify how to build it .

The main part . Mathematical calculations of excavation optimal only provided if the selected area contributes to the design of a single ramp . The task is complicated if the proposed site requires holding a series of PP ramps for drainage . Become popular breaklines carrying information about slopes. Therefore, a new terrain model bearing the most complete information about the structure of the surface (Fig. 1).

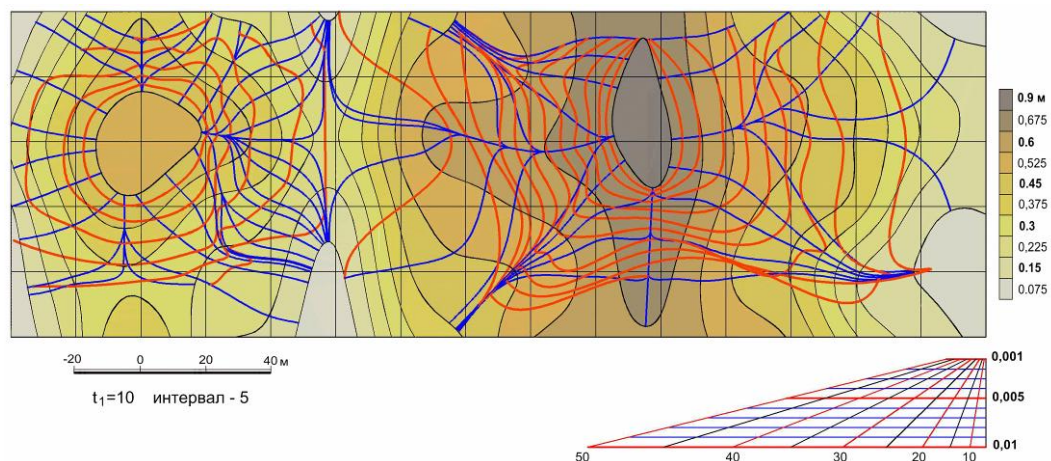


Fig. 1. The proposed new model is supplemented by relief lines isochrones.

The proposed new model information isolines converted to scale heights (on the right) , by color scale compared altitude data. Under the scale bar provides information about the formations lines isochrones ($t_1 = 10$ means the start time

begins with the tenth unit and subsequent lines isochrones formed at intervals of 5 units) . Measuring intervals of arbitrary plot lines isochrones should compare them with the line of the proposed nomograms (at the bottom right) and identify the general slope of the site on the vertical scale .

To select the optimum bandwidth watershed lines and longitudinal thalweg are abroad, and isochrones and determine the extent of the region are relatively transverse boundary slope areas.

Structural lines can determine the optimal position of the boundaries of design surface. They are especially important when choosing a design surface at a number of inclined planes in complex terrain (Fig. 2)

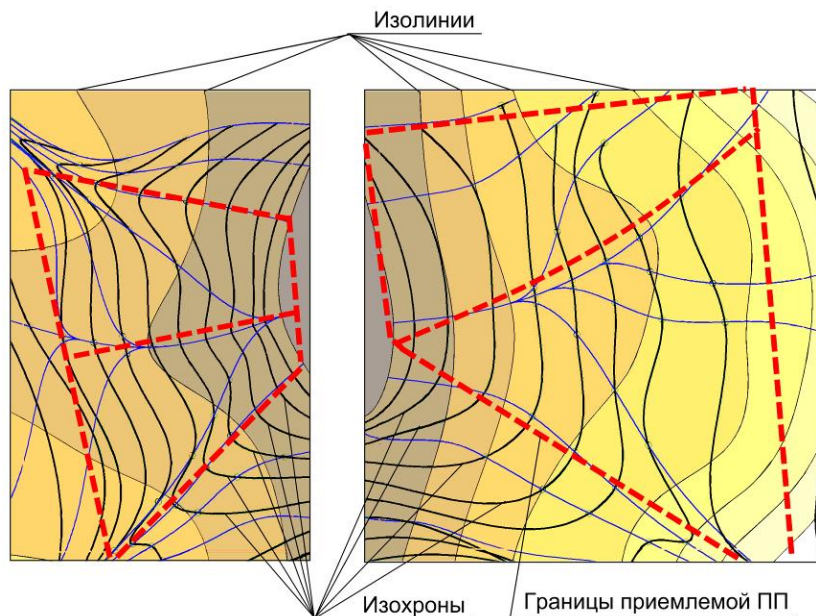


Fig. 2. Isochron surface.

In the study of the isochronous lines should pay attention to the distance between the lines and their intensity changes. If the interval between the lines evenly growing and the other portions of the surface has small intervals (Fig. 3) Section 1, this portion of the surface has the smallest bias towards another (section 2) which are also intensive growth, but with greater intervals .

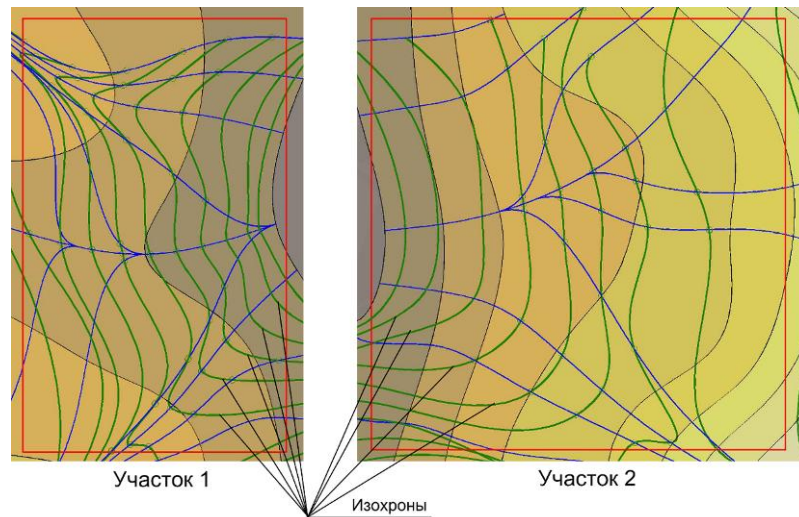


Figure 3. Isochron surface.

You can confirm the above, comparing the two plots on the ratio of the number of contour lines isochrones: the first section of $3/11 = 0.272$, the second $7/8 = 0.875$. Since the number of horizontal lines isochrones is zero, the first section has the smallest deviation in relation to the second.

Analyzing this surface using a software application "Complexity relief" can visually confirm the outcome, as the program provides visualization of surface areas of difficulty in the form of cartogram (Fig. 4) [4].

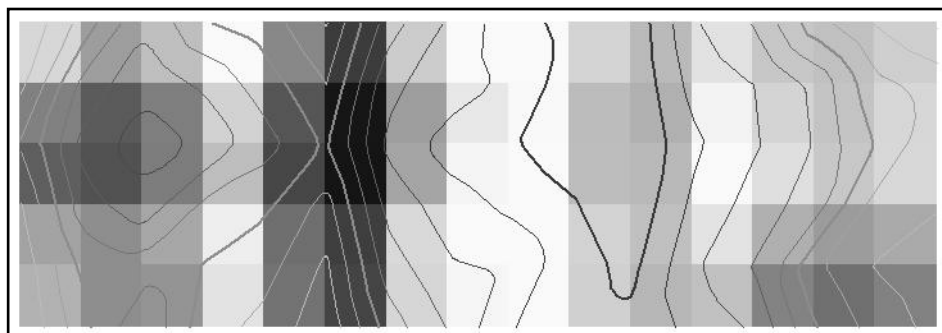


Fig. 4. Cartogram relief complexity.

Comparing cartogram of complexity to the proposed relief topographic map, we can see that the dark spots are formed cartograms exactly on the lines of the watershed and the thalweg, and line cards have proposed isochrones degradation in these areas. Also noticeable is relatively calm development lines isochron maps highlight areas cartograms.

Conclusions and prospects for further research. Proposed model for relief on the basis of structural lines is the most informative with respect to topographic maps. She also favors the choice of different options to address sanitation problems. Further research is expected to consider these options.

Literature

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Анотація

Кучкарова Д.Ф., Хаитов Б.У. Геометричне моделювання рельєфу для інженерних завдань водовідведення. Обґрунтовано перевага вибору проектної поверхні на основі структурних ліній рельєфу в інженерно-проектних завданнях вертикального планування.

Ключові слова: проектна поверхню, рельєф, структурні лінії, лінії ізохрони

Аннотация

Кучкарова Д.Ф., Хаитов Б.У. Геометрическое моделирование рельефа для инженерных задач водоотведения. Обосновано преимущество выбора проектной поверхности на основе структурных линий рельефа в инженерно-проектных задачах вертикальной планировки.

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