CREATION OF ROAD PLANS FOR VARIOUS TERRAINS USING THE MODERN CREDO SOFTWARE COMPLEX

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Yo'l rejalarini zamanoviy Credo dasturiy ta'minot majmuasidan foydalangan turli bo'lgan relefini tashkil etish rejasini tuzish.

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A B S T R A C T	K E Y W O R D S
At present, in the design and construction of settlements, industrial enterprises, transport communications, canals and other structures, along with traditional design methods (analytical, graphic, model-graphic, layout-graphic), automated design systems based on the use of digital terrain models (DTM) are increasingly used. It is the DTM that is the source material for the operation of computer-aided design systems (CAD) for construction and automated control systems (ACS). The use of DTM significantly simplifies and accelerates many processes of urban management, from calculating areas to compiling lists of tax defaulters.	Credo, design systems, computer-aided, CREDO_DAT, elevation model

Introduction

CREDO software products operate on their own information and tool platform without using other graphic systems. At the same time, all systems of the CREDO complex are open for export/import from other design systems, such as AutoCAD, Intergraph, etc. Modules (systems) operate on all PC-compatible computers and do not require additional software and hardware. Interactive graphics and powerful intellectual support allow each CREDO user to fully utilize the advantages of modern technologies, make a carefully thought-out and reasoned decision, and receive satisfaction from the work process and its result. (Wakefield, J. C. (2022). Klerman's "credo" reconsidered: Neo-Kraepelinianism, Spitzer's views, and what we can learn from the past. World Psychiatry, 21(1), 4-25. n.d.)

All CREDO systems operate with a single set of data in a common shell, which ensures the continuity of the survey and design processing process, provides the ability to carry out variant design and fully implement modern efficient technologies. At the same time, each module of the CREDO complex is an independent software unit and can be used separately. (Radke, D., Larson, K., & Brecht, T. (2022). The importance of credo in multiagent learning. arXiv preprint arXiv:2204.07471. n.d.)

Let us consider in more detail the capabilities of the CREDO_MIX system, which is designed to create a digital terrain model and solve problems of designing horizontal and vertical planning of industrial, civil, road and railway construction projects [9]. Such objects may be city streets and roads; public highways; railways, industrial and logging roads; pipelines, general plans of civil and industrial facilities; urban microdistrict, airfield, etc.

The main feature of this system is the ability to accurately analytically calculate complex geometric constructions in combination with interactive graphics and work on a digital terrain model. This significantly expands the capabilities and speeds up the work of the designer, allows for accurate, high-quality and efficient design of industrial and civil facilities, highways and railways. The system is intended for the design of new construction and reconstruction of highways of II - V technical categories.

The main volume of data for the formation of a digital elevation model and situation comes from CREDO_DAT, CAD_CREDO and other systems for collecting and processing topographic information. These data are received through an open exchange format and can contain all the information necessary for fully automated construction of a DTM.

The digital model exists in a separate information layer, therefore, when constructing with the capture of geometry points, points of the DTM structure are created, their coordinates are rounded.

A digital elevation model (DEM) is a set of triangular faces constructed on points (face vertices) with coordinates X, Y, Z. The constructed set of triangular faces is called triangulation. The set of triangles approximates sections of various surfaces (natural and planned surfaces of the Earth, artificial surfaces, surfaces of individual geological layers, etc.).

A section of the surface approximated by a set of triangular faces is limited by a contour. The surface contour is a closed, non-intersecting broken line. In the DEM of real objects, as a rule, there can be many contours. In order to unambiguously define the DEM, each selected surface area can belong to only one contour.

Based on the DEM, CREDO systems solve problems of designing engineering objects, and at the same time, the surface relief is displayed on the screen and in hard copies in the same way as on topographic maps and plans: contours, conventional signs of cliffs and slopes, etc.

RESEARCH RESULTS

Each segment of the structural line in the formation of the DEM is an edge of a triangle. Structural lines allow you to clearly define characteristic relief forms: hollows (thalwegs), ridges (watersheds), etc. Structural lines should be created in cases where it is necessary to change the relief as a specialist sees it. For this, you can use additional field information about the features of the relief, reflected, for example, in outlines, codes of electronic recorders, etc.

A relief contour is a surface area with a uniform relief. A uniform relief should be understood as a set of irregularities similar in outline, size, origin, age and history of development. Thus, the entire surface of a terrain area formed as a DEM is represented as one or more contours. This allows you to highlight relief forms at the boundaries of which the contours break, shift or break off: cliffs, pits, slopes of cuts and embankments, reservoirs, quarries, surfaces with artificial surfaces, etc.

The CREDO_MIX system allows you to display the relief within the corresponding contour with various types of contours:

- approximation and linear-interpolation splines: natural surfaces;

- straight linear-interpolated: anthropogenic relief forms.

Within the contour, you can draw additional contours and change the step of the contours.

In some cases, the relief does not need to be displayed with contours, for example, artificial surfaces, reservoirs, etc.

Cliffs and slopes are displayed in a separate contour with the appropriate symbol.

The system of relief contours when constructing a DEM forms a topologically correct set. The unambiguity of creating a DEM when constructing contours is ensured by their different mutual arrangement:

- intersecting contours; - adjacent contours;

- internal contours that touch or do not touch the external contour.

Surfaces constructed in different contours may, of course, look different. But the interrelation of contours is manifested when the system determines the parameters of their intersection points and when using the operations of deletion, modification and contours. (Madiev, F. M., Karimova, Z. Z., & Khudayberdiev, A. (2023). Perfection of the Backbone Network of the Central Zone of in Samarkand. International Journal of Development and Public Policy. n.d.)

A digital model of the situation (DMS) is a system of situation elements as a set of conventional signs on a plan, which display various topographic information. As a rule, in the CREDO_MIX system, the DMS is formed on the basis of relief and situational points. DMS elements are displayed by scale and off-scale conventional signs. The system of DMS elements includes area, linear and point objects. (Madiev, F. M., & Khaydarov, S. Z. (2020). SHAKHRISABZ CITY–ARCHITECTURAL HISTORICAL RESPONSIBILITIES. FM Madiev, & SZ Khaydarov (Muh.), Zbiór artykułów naukowych recenzowanych. da, 6, 58-61. n.d.)

An area object is a surface area limited by a situational contour and filled with a scale conventional sign (forest, farmland, building, etc.). The contour line is displayed by the corresponding conventional sign, and the contour area is highlighted in color and conventional filling signs. The object itself can screen relief elements. The area object can be assigned the necessary semantic information. The contours of area objects have the same properties as relief contours, i.e. the system provides a topologically correct set of contours.

Linear object - a straight or broken line with an out-of-scale expressed width, displayed by the corresponding conventional symbol (power transmission lines, fences, boundaries, etc.). A linear object has the same properties as any line in CREDO_MIX.

Figure 1. Mark output.[1]

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[1] https://triptonkosti.ru/5-foto/kredo-kadastr-mezhevoj-plan-84-foto.html

In accordance with the concept of representation in CREDO_MIX of a volumetric model of a design object, any design solution is described by a structural geometric model, which reflects not only the mutual arrangement of the elements of the object in space, but also their geometric shape. The structural geometric model is constructed using methods of structural and parametric synthesis, which makes it possible to design construction objects, starting from the construction of lines on a plane to spatial lines that form complex surfaces, and through them to volumetric models of objects. (Kaneda, K., Shiomi, H., Abe, M., Morimoto, T., Yamamoto, K., Obayashi, Y., ... & CABG Registry Cohort-3 Investigators. (2023). Post-contrast acute kidney injury after emergent and elective percutaneous coronary intervention (from the CREDO-Kyoto PCI/CABG n.d.)
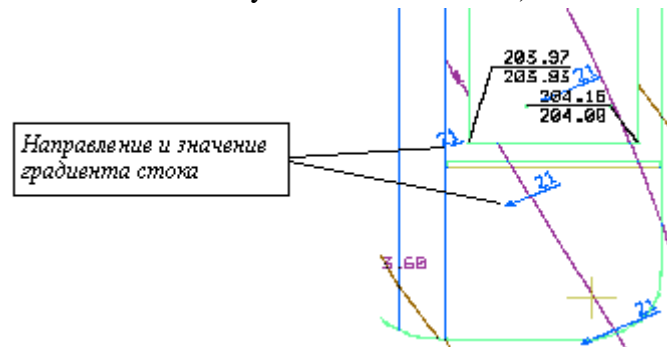

Figure 2. Direction and meaning of flow[2]

CONCLUSIONS

The design object can consist of one route or be composed of several routes of different configurations. Several objects can be designed in one catalog on the same DTM. Longitudinal and transverse sections can be made along the routes. A longitudinal section is made along the route, and a transverse section is made along the normal to it. Longitudinal and transverse sections can be viewed to analyze the placement of the design object on the earth's surface and relative to other objects on the ground.

The functions of the CREDO modules make it possible to:

- collect and process topographic and geodetic information using various methods: electronic geodetic instruments of various types, traditional methods of linear and area surveys, scanning existing cartographic materials, using materials created in other information and software systems;

- generate digital terrain models for engineering purposes and provide them for further use in paper (tablets or sheets) and electronic (various output formats) form; - design and maintain general plans using DTM: detailed planning, communications, "red" lines, layout, etc.;

- create a volumetric geological model of the area based on a technique that allows for the simultaneous construction and correction of several vertical engineering-geological sections of arbitrary topology;

- collect data for geoinformation systems;

- process geodetic data for seismic exploration;

- design the geometry of transport facilities of any complexity (transport interchanges, intersections, overpasses, highways);

- perform a full range of design and survey work for the design of suburban highways of II - V categories.

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[2] https://rutube.ru/video/1a39e7d0bb6eaec108ab216d009e1629/

REFERENCES

1. Achildiev, R. M., & Ibragimova, S. I. (2023). BASIC METHODS FOR PROTECTING THE URBAN ENVIRONMENT FROM TRAFFIC NOISE. PROBLEMS OF ARCHITECTURE AND CONSTRUCTION (SCIENTIFIC TECHNICAL JOURNAL), 1(2), 690-694. n.d.

2. Alessandri, S., Ratto, M. L., Rabellino, S., Piacenti, G., Contaldo, S. G., Pernice, S., ... & Alessandri, L. (2024). CREDO: a friendly Customizable, REproducible, DOcker file generator for bioinformatics applications. BMC bioinformatics, 25(1), 110. n.d.

3. Harris, A. (2022). Credo. In Psychoanalytic Credos (pp. 113-120). Routledge. n.d.

4. Kaneda, K., Shiomi, H., Abe, M., Morimoto, T., Yamamoto, K., Obayashi, Y., ... & CABG Registry Cohort-3 Investigators. (2023). Post-contrast acute kidney injury after emergent and elective percutaneous coronary intervention (from the CREDO-Kyoto PCI/CABG . n.d.

5. Madiev, F. M., & Khaydarov, S. Z. (2020). SHAKHRISABZ CITY–ARCHITECTURAL HISTORICAL RESPONSIBILITIES. FM Madiev, & SZ Khaydarov (Muh.), Zbiór artykułów naukowych recenzowanych. da, 6, 58-61. n.d.

6. Madiev, F. M., Karimova, Z. Z., & Khudayberdiev, A. (2023). Perfection of the Backbone Network of the Central Zone of in Samarkand. International Journal of Development and Public Policy. n.d.

7. Radke, D., Larson, K., & Brecht, T. (2022). The importance of credo in multiagent learning. arXiv preprint arXiv:2204.07471. n.d.

8. Wakefield, J. C. (2022). Klerman's "credo" reconsidered: Neo-Kraepelinianism, Spitzer's views, and what we can learn from the past. World Psychiatry, 21(1), 4-25. n.d.