
Use of Software Products in Serial Calculation of Coordinate Systems

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Abstract: Consideration and substantiation of coordinate systems that allow automation of cadastral work for the territory of Uzbekistan.

Keywords: Coordinate system, cadastre, geocentric coordinate systems, transverse-cylindrical projection, project, graph, ellipsoid.

Relevance of the topic. In recent years, there has been an active discussion of issues related to the use of the local coordinate system (LCD) for cadastral purposes.

Due to the fact that the local coordinate system is not developed on the basis of uniform rules and requirements throughout the country, today there are problems in combining the results of surveys performed for cadastral purposes, ie creating integrated maps of the area by combining plans for neighboring areas. To this end, there is a need to develop MCTs for cadastral entities in the regions.

The purpose of the study. The main purpose of this dissertation is to analyze the coordinate systems currently used for geodetic purposes using scientific and practical sources.

Research methods. Systematic analysis, information theory, mathematical methods were used as a method of theoretical research. As an experimental method, the transition from the local coordinate system to a single state coordinate system is carried out using special programs.

In order to determine the connection parameters of coordinate systems and reshape the coordinates, enterprises and organizations in the Republic widely use the TRANSKOR program of the CREDO complex and a number of their own developments. The latter, in most cases, do not have complete documentation, are not certified, and, as a rule, are not replicated. Therefore, below we will consider only the possibilities and peculiarities of the coordinate reshaping of the TRANSKOR program of the CREDO complex.



1 - picture. The main window of the TRANSKOR program

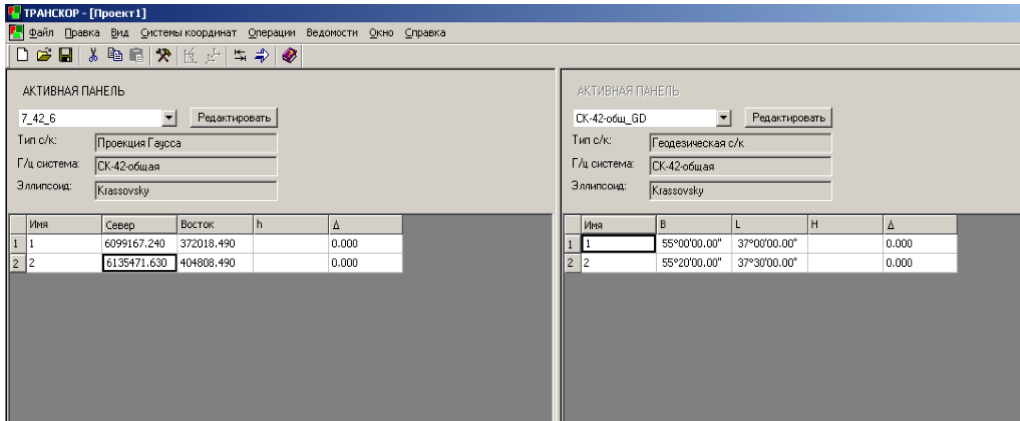
This program is part of the CREDO complex, whose main tasks are a complete mathematical processing of the results of field measurements, the creation of an encrypted model of location and the solution of various problems based on it (in particular, topographic planning, demarcation of land plots). the formation of materials and documents in the identification, etc.). TRANSKOR program reconfigures geomental, geodetic (ellipsoidal) and right-angled flat coordinates according to certain parameters of the connection, as well as to determine these parameters by groups of points whose coordinates are known in this or that system. designed for. It supports the following coordinate systems:

- Geocentric coordinate systems (rectangular coordinate systems in latitude) that differ in parameters and orientation in the Earth's body;
- geodetic coordinate systems (ellipsoidal coordinate systems) determined by the ellipsoid parameters and the orientation of the ellipsoid coordinate axes;
- Rectangular flat coordinate systems based on the use of Mercator transverse-cylindrical projection (Gauss - Krueger, UTM) and the choice of ellipsoid parameters, the orientation of its coordinate axes, projection methods, etc.,
- ma'local coordinate systems set for a lum territory and associated with the state coordinate system with certain parameters (keys).

The program provides the ability to recalculate coordinates from one system to another, determine their connection parameters and perform a number of other functions. In general, the procedure for processing information includes:

- creating a new project or disclosing an existing one;
- initial settings, including the definition of working coordinate systems and the expression of their parameters;
- import data or enter them using a table editor;
- data processing, the content of which is determined by the content of the initial information and the nature of the problem to be solved;
- printing and (or) export of processing results. Program operation is controlled using icons, keys, or main menu commands selected from the corresponding lists on the toolbars.

Creating a project. Creating a project is a team effort -, then two panels will appear in the center of the screen, one on the left to place the initial coordinates, and the one on the right to place the reconstructed coordinates (Figure 2). Both panels contain brief information about the coordinate system provided or where the coordinates of the points should be calculated.



2 - picture. Creating a project in the TRANSKOR program

Initial settings of the program. The program's initial settings provide units for measuring angular and linear quantities, the order in which they are written, the input and output coordinate systems, as well as the format for presenting data in the left or right panel of the working dialog. Information about coordinate systems is given in a special dialog box (Figure 3). It contains the information provided for editing: system type, ellipsoid, zone number and width, axis meridian, information about shifts along the coordinate axes. The presence of such settings allows to describe both SK-63 and other coordinate zones. Special tools provide the ability to edit, populate, and more.

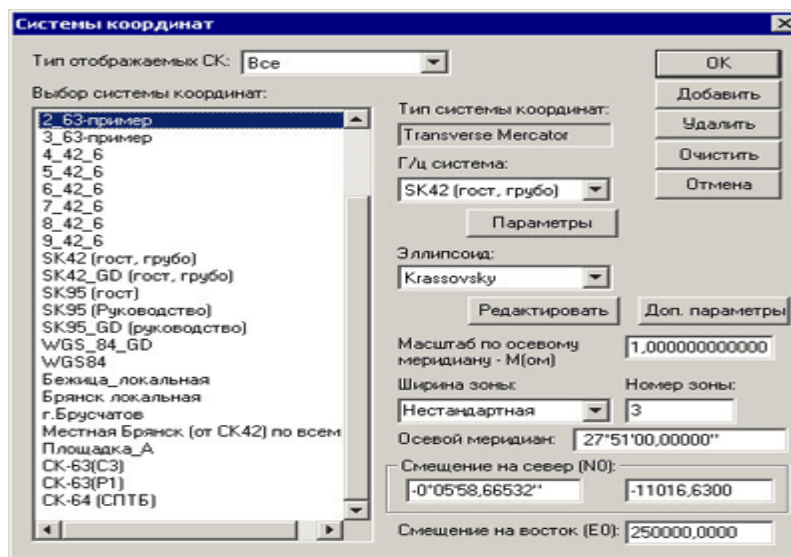


Figure 3 Parameters of flat rectangular coordinate systems.

Enter data. Data entry is done by entering the numbers and coordinates of the points in the corresponding columns of the tables, or by importing pre-prepared files into the active table of the left or right panel. The program allows the use of several formats of data presentation, including both internal and external formats, in the latter case it is allowed to use a "free" text format based on the use of ASCII - codes, which can be adjusted by the user.

Information processing. Information processing is carried out according to strict mathematical formulas discussed in Chapters 1 and 2; the least squares method is used to determine the connection parameters of the two coordinate systems, and the residual differences in the coordinates of the starting points are determined. In the general case, information processing involves two groups of problems, one involving the reshaping of coordinates from one system to another, and the other involving finding the connection

parameters of two given coordinate systems. In both cases Coordinate systems discussed above: geomental, ellipsoidal (geodetic), local or cartographic coordinate systems provided by any of the coordinates obtained by conformal projection (SK-42, SK-63, SK-95, etc.) goes to the grave.

Reshaping coordinates from one system to another. Reconstruction of coordinates from one system to another can be done according to the formulas (1.1), (1.2), (1.3) (2.2), (2.5) (2.8), (3.1), (3.2), (3.5). To do this, the initial coordinates are entered in the left panel of the working dialog box (Figure 3.6) and the system in which they are defined is defined. The resulting system is then displayed in the right pane, and the reshaping is performed using the Operations reset command of a special icon in the menu or toolbar. In this case, the searched coordinates are automatically entered in the right panel of the working dialog box (Figure 4). The mode of operation remains unchanged in any transformation of any coordinate systems:

- when reshaping from one geocentric system to another geomascular, geodetic, or cartographic system on the same ellipsoid itself or on another ellipsoid;
- transformations from one coordinate zone of the projection to another (including those with non-standard axis meridians and abscissa shifts or non-shifts), transformations from the state coordinate system to the local coordinate system, and so on.

Enter certain parameters of the transformation of coordinates found on the basis of orthogonal (Gelmert), conformal or affinity models (3.6, a), (2.5) or (3.6, b) into local coordinate systems through a special dialog box (Figure 4) and then can be used to recalculate from one system to another. In this regard, it should be noted that the calculation scheme of the determinations made in the program and the keys of the local coordinate system use is less consistent with content practice, in particular:

- the program does not have information about the generating coordinate system (the keys of the local system are defined in relation to it) and before using its keys it is independently transferred from the initial system to the generating system;
- coordinates local when reshaping from the coordinate system to the state coordinate system and vice versa, the user must not forget the change in the angle sign and the scale coefficient;
- The program always identifies and uses the six parameters of the connection of coordinate systems, although their set cannot be changed even if it is known that this should not be the case.

The above-mentioned features make it difficult to use the keys of the local coordinate system, which are officially installed in its creation and stored in the state geodetic control bodies. The resulting coordinates can be printed or imported into a file for use in other applications.

Search for reshaping parameters. Single coordinates Figure 4. The search for the parameters of the rearrangement from the system of entering the parameters of the change of coordinates to the second coordinate system is carried out by the method of least squares on common points. A prerequisite for determining the parameters of the reshaping of geocentric coordinate systems on the basis of dependencies, in the reconstruction of cartographic coordinate systems (including local coordinate systems) - (3.6, a), (3.6, b) or (3.6, c). In the program (3.9) the method of finding the parameters of the local coordinate system based on the condition SK-42 is implemented.

Additional calculations. Calculations based on the program under consideration allow to determine:

- the average radius of curvature R according to the formula for a given ellipsoid and the width of the point;
- scale coefficient to reduce the length of the lines to the surface of relativity;
- the *Gaussian convergence* of meridians equal to the value of the angle between the axis meridian and the meridian at a given point.

The calculated values can be copied to the clipboard and used to process the data.

The peculiarity of the reconstruction of cartographic images by means of geographic information systems is that they always refer to a layer, class or type of objects, that is, to this or that image, and not to a single point or group of points. These images can be presented in raster or vector form, and the latitudinal position of the elements that make them up should be given by geodetic (V, L) or right-angled flat (x, u) coordinates. The set of cartographic transformations and the content of the corresponding procedures (orderly actions) will depend on exactly in which geo information system environment they are performed.

Arc View has long been used by geographic information systems to run geo information systems with rectangular flat x, y coordinates in SK-63. In this regard, the image is available only in the environment of version 3.x of the geographic information system Arc View <<Projection>> which must be done using the module.

When loading into a data system provided with geodetic latitudes and distances, it will be necessary to determine the characteristics of the species by specifying, in particular, cartographic projection, ellipsoid, distance (length) of the arrow meridian, scale of its representation and displacement of the origin. The specified parameters are set in the Projection Properties dialog box, access to which is performed by the Projection key of the Type Properties dialog box, which can be opened with the *View / Properties* command.

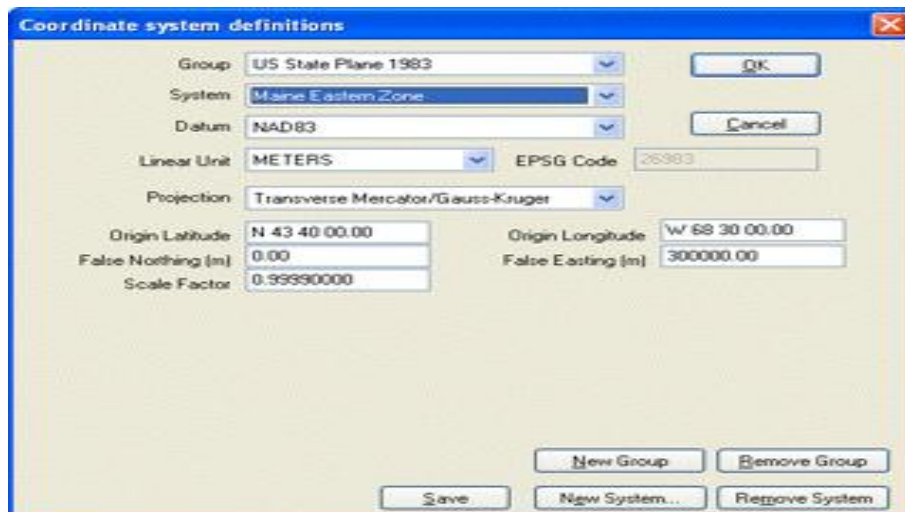


Figure 4 Changing coordinates in Arc View

<< Default>>On the activated toggle connector (switch) the projection parameters are set by default (default); Activating the connector by switching to “*User Defined*” allows you to set them from non-standard values. A single projection and coordinate system must be installed for all themes and layers of a single type of Arc View. The Gaussian-Krueger projection, which does not exist in the Arc View geographic information system, is replaced by the **Mercator transverse projection**, which has the properties of the Gaussian-Krueger projection when the scale of the axis meridian is equal. It should be borne in mind that, - In western software products, the projection properties in the lower two rows of the dialog box

mark the coordinate axes when the X abscissa axis coincides with the equator, and the Y ordinate axis corresponds to the right (English) coordinate system. Therefore, when using the left (French) coordinate system where the abscissa axis is merged with the axis meridian, it will be necessary to replace the Xva No. Hence, the "X-shift" and "G-shift" properties of the projection (Figure 5) are "G-shift" and "X-shift". should be interpreted as. Appropriate selection of the axis meridian, its scale and displacements along the coordinate axis Arc View created in the geographic information system Gauss-Kruger, UTM projections, as well as coordinate zones SK-42, SK-95, SK-63 and special coordinate zone allows you to describe local coordinate systems. With this in mind, it is sufficient to change the corresponding parameters to reshape the cartographic image into a different projection or other coordinate zone. For example, in order to reflect the type (project) in the adjacent coordinate zone, it is necessary to change the distance (length) of the axis meridian in the corresponding row of projection properties (Figure 5).

Conclusion

In the survey of gas, oil pipelines and transport highways passing through the territory of several entities, for long-distance and narrow areas of the site, the parameters of the transition of neighboring areas MKT relative to each other should also be known.

In addition, we would like to note that in the development of MKT for the subjects of the Republic of Uzbekistan on the basis of SK-42 requires special attention to the restrictions on the mode of use of geodetic and cartographic products. Sooner or later, the existing limitations in finding optimal solutions in this regard will be removed.

Until then, however, the local coordinate system has been in practice for a long time due to regime constraints. In addition, by entering the parameters of the transition from local coordinate systems to a single state coordinate system, ie "key" in modern GIS programs, it is possible to easily transfer the results of the survey in MKT to YADKT. At the same time, without compromising the level of confidentiality of the coordinates, it is possible to transfer the maps and plans of the database to the MKT and distribute them to users.

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