# DATA ENTRY TECHNOLOGIES FOR GIS

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In accordance with the technical means used, there are two ways to enter data: digitalization and vectorization. A digitizer is used to manually enter spatial data. It consists of a tablet (table) with an electronic grid, to which a device called a cursor is attached. The cursor is a kind of graphical manipulator - a mouse; it has a viewer, applied on a transparent plate, with which the operator performs precise pointing to individual map elements. The cursor contains buttons that allow you to fix the beginning and end of the line or the border of the area, the number of buttons depends on the level of complexity of the digitizer. Digitizers come in various formats and provide a resolution of 0.03 mm with a total accuracy of 0.08 mm at a distance of 1.5 m. There are automated digitizers that provide automatic tracking of lines.

The most common for data entry received scanners. They allow you to enter a raster image of the card in the computer. There are various types of scanners, which differ in the way the source material is fed (tablet and lingering (drum type); the method of reading information (working on the light or reflection); radiometric resolution or color depth; optical (or geometric)

resolution. The latter characteristic is determined by the minimum size of the image element, which is different by the scanner.

The process of digitizing a bitmap on a computer screen is called vectorization. There are three ways to vectorize: manual, interactive, and automatic. With manual vectorization, the operator traces each object with the mouse on the image, with interactive vectoring, some operations are performed automatically. For example, when vectoring contours, it is enough to set the starting point and direction of line tracking, then the vectorizer will track this line itself until it encounters uncertain situations, such as a line break. The possibilities of interactive vectorization are directly related to the quality of the source material and the complexity of the map. Automatic vectorization involves direct conversion from raster to vector using special programs, followed by editing. It is necessary, because even the most sophisticated program can incorrectly recognize an object, for example, take a symbol as a group of points, etc.

Scanned source maps were created in a specific map projection and coordinate system. When digitizing, this complex projection is reduced to a set of spatial coordinates. Therefore, it is necessary to convert the map to its original projection. For this, information about the used projection is entered into the GIS (usually the GIS allows working with a large number of projections) and a number of transformations are carried out. The three main ones that are often performed simultaneously are transpose, rotate, and scale.

A transfer is simply the movement of the entire graphic object to another location on the coordinate plane. It is performed by adding certain values to the X and Y coordinates of the object:

· Scaling is also very useful, as often maps of different scales are scanned, for this purpose they use the ratio;

· Rotation is performed using trigonometric functions;

· All the necessary transformations can be performed using these three basic graphic operations on the coordinates of the control points.

In GIS, it is not the DZ primary materials obtained at the time of the survey that are used, but the derivatives formed as a result of their processing. Satellite data is pre-processed to eliminate radiometric and geometric distortion, atmospheric effects, etc. To improve the visual quality of the original images, procedures can be applied to change the brightness and contrast, filtering to eliminate noise or underline contours and small details. When using aerial photographs, attention should be paid to the distortion caused by the angles of inclination of the images and the terrain, which can be eliminated in the process of transformation or orthophototransformation.