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SPATIAL DATA INTERPOLATION

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ABSTRACT:
During the study and adjustment, techniques revealed our analysis of spatial data in vector format. The latter is best suited for the spatial analysis of discrete objects. However, when the spatial variable is represented as a field of scalar or vector greatness (for example, the spatial distribution of concentrations of heavy metal concentrations in soils or groundwater movement speed field). Convenient ways to record data is bitmap format. This approach is most often used for phenomena of processes that are characterized by considerable anisotropy. However, the characteristic feature of the method of inverse distance is the fact that the interpolated value in measured point is equal to the measured value.
Key words: erosion, soil; heavy metals, extremum, spatial data, raster data anti-erosion measures

1. INTRODUCTION:

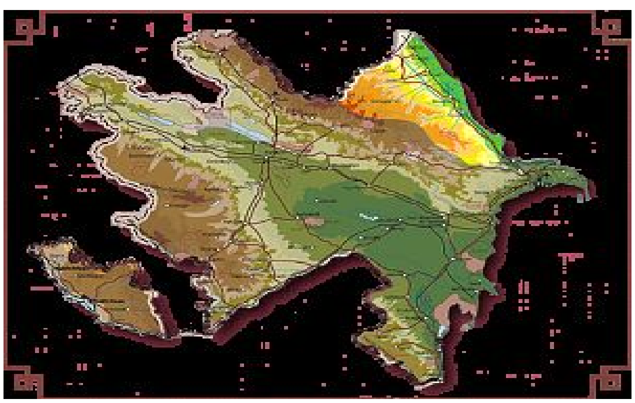

Figure 1: Geoinformational map of Azerbaijan

1.1. The interpolation method for spatial data space consists of infinitely number of points and is divided into a certain number of rectangular fields, called pixels, mudflows, attributed to a specific value. 1 most often possess limited quantities of information on spatial layout of the studied variable.

In General, our knowledge is limited to a specific end measurement points on the basis of which draws conclusions about the potential distribution of the values of the remaining points of space.

Collect data in measuring points can be considered as a random number based on which runs prediction out testing points. This process is called interpolation of spatial data.

There are many methods of interpolation data.

Below are selected methods that are available in AreGIS. One of the most popular methods of spatial data interpolation is a method of inverse distance (Eng. Inverse Distance Weighted). This method, the main of which is the autocorrelation of spatial data. Autocorrelation means that the spatial variable at a point x is associated with values near this point, with the power of communication decreases together with the distance (d).

The magnitude of the investigated variable interpolation point in z (x) is defined as the weighted average of the points measured around z, with the force of its impact on the next point w is reduced at the same time with the distance to the measuring point (d).

z (x) = $\sum \boldsymbol{w1z1} \sum \boldsymbol{w1}$
(1)

There are several methods to determine the values of the coefficients of force impact. Most often use a fraction of the square of the distance is:

W1 = $\boldsymbol{1}\ \boldsymbol{d} \int \boldsymbol{1}$
(2)

This method minimizes the effect of measurement points located farther than the value of z (x) calculated in point interpolation, since increased twice the distance leads to a fourfold reduction in force of influence. This corresponds to the position on the reduction of the force of spatial autocorrelation simultaneously with increasing distance. Interpolation algorithms based on method of inverse distance, give you the ability to search within a radius measurement points interpolation points, as well as define the points from which will be taking values for calculations. This is possible because when (d) striving for zero, the value of w, sent to infinity.

The method properties have an indisputable advantage, but (ironically!) at the same time and the greatest limitation, which gave the results in example creating soil-digit card Zakatala district of Azerbaijan, fig. 2. Soil-digital map of Zakatala district, this means that the extremum of forecasted spatial distribution is always attached measuring points. If we consider the results obtained in measuring points. If we consider the received measuring values as a number of random points, then chances are that the testing point corresponds to the highest or lowest values of localization in the analyzed field is close to zero.

1.2. Creating raster spatial distribution of values of a specified parameter Interpolation of spatial data in ArcMap program is possible thanks to the application of Spatial Analyst extension. So the first task will be to the appropriate device the working area.

1. In the Tools menu, select Extensions.

2. In the Select graph to denote Extensions near the position of the Spatial Analyst extension and click Close. Thus was activated tool for spatial analysis of raster and vector data. Now the new extended interface functionality of the toolbar.

3. Click with the right mouse button on a free space in the toolbar.

4. In the menu, select the Spatial Analyst extension. The image will be added to the toolbar, shown on Figure 3. Fig. 3 Spatial Analyst toolbar spatial data interpolation Technique, consider the example of creating a map of soil contamination with caesium on site x.

This requires the presence of two vector layers:

1) polygonal-territory boundaries;

2) dot-cesium concentrations measurements in points of the study. Begin analysis with Spatial Analyst application options.

1. Spatial Analyst menu on the toolbar, select Options.

2. In the Options window, turn to the General tab (Figure 4). Fig. 4. Defining properties of Spatial Analyst

3. In the column denote the Working directory path to the folder where will be written the analysis created by bitmap files.

4. Analysis Graph mask define territory for analysis using a shape file, i.e. Select polygonal boundary layer prepared by the studied territory.

5. The Analysis frame Coordinate System, select a coordinate system for screens with analysis (for example, Pulkovo 1942).

6. Go to the bookmark Extent. Here we indicate the spatial boundaries of the analysis (the coordinates of the endpoints). Click Same As Layer (i.e. the territory boundary layer prepared by research) Analysis list Extent.

7. Go to the bookmark Cell Size determine the size of the resultant image. From the list, select the option As Specified below, in the Cell Size, enter 250. This means that the generated value calculated layers are cesium concentrations in the soil.

In the columns below, the number of rows and columns will be displayed for the desired resolution of the analysis.

8. Confirm the changes-OK.

1. In the Spatial Analyst menu, select Interpolate to Raster, and then inverse Distance weighted. The window shown in Figure 2 (5) appears.

2. In the Input Points column, select the file with the primary data for interpolation (Punkty).

3. The Z value field is used to select the attribute to be interpolated. From the list of available attributes, select "Cesium".

4. In the Power column, specify the distance to calculate the magnitude of the force of influence points. We recommend leaving the automatic value of this parameter.

5. The indicator counts Search radius type determines the way of choosing interpolation points. Select the value of the Variable. This allows you to determine the number of measuring points tried and their forecasting the maximum distance from the interpolation points.

6. In the box Search Radius Settings to count the Number of Points, enter a value of 5. Maximum distance graph we leave empty. In such a way that the interpolation at each point will be undertaken on the basis of the nearest 5 measurement points.

7. Note that Cell Size graph automatically attributed value of 250, according to the previously executed commands.

8. In box, enter an arbitrary name effective raster layer, such as Cesium.

Select OK to start the interpolation process. If the data interpolation process expires correctly, the result in the form of a raster layer will be added to the work area. Figure 4 shows an example of the interpolation of cesium concentration measurement data in the soil of the X territory. The automatically raster layer opens in the Classified mode. This means that the values will automatically be classified on the basis of the 9-step scale by the corresponding colors. However, you can change the layer display mode.

To do this, go to the window with the properties of the layer (similarly as for vector layers).

1. Go to the Symbology tab (Fig. 5), where two layers are displayed for selection: Classified (Separate) and Stretched (solid). Choose the second.

2. Using Color list, select the color scheme of the Ramp for the layer. Here the colours presented in the form of a rise in the intensity of color. If you want to show changes in the intensity of the colors in the reverse order, select Invert. In the column Label (label) you can specify values that are in the legend of the map. 3. go to the frame Stretch. Type from the list, select the amount of Standard Deviation. Enter amount in box n 4.

4. Confirm changes-OK. In this case, the spatial distribution of a variable is represented by a solid way, allowing you to better analyze the spatial variability of investigated characteristics. However, for greater readability of the card user should be able to directly determine the size of the variable at the specified point.

1. Transition to the window with the properties of the layer, and choose the Display tab.

2. Select the Show Mar Tips option and click OK.

3. In the image window of the map, draw the cursor over the area of the raster layer. Near the cursor, the value of the variable at that point will be highlighted.

The above method gives good results if we work with the card in the cipher version. However, when the created card must be paper, the interactive mode with the digital card becomes impossible.

In this case, to better display the spatial variability of the parameter, you should apply an isoline map, which can be superimposed on the raster layer.

1. In the Sparial Analyst menu, select Surface Analysis, then Coytrour.

2. In the open Contour Input Surface window, the name of the created raster layer should appear. Otherwise, you must select the appropriate layer from the file list.

3. In the Contour dtfinition box, you can define the section of isolines and the base contour. In the Contour interval column, enter 0.5, and in the Base cotourour column leave the value 0. In the box below, information will appear on the choice of parameters, namely, the number of isolines and extreme values, confined to isolines.

4. In the Out Features column, specify the localization and the name of the source file.

5. Click OK. To the image will be added a vector layer with drawn on the basis of the raster layer isolines and assign them inscriptions.

6. Go to the window with the properties of the izolinie_Cez layer and select the Label tab.

7. Denote the Label features in this layer.

8. In the Label Field from the list, select Contour.

9. Set the size and color of the font of the inscriptions. To change the way the labels are placed, you can change the different options that will be available after selecting Placement Properties.

10. Confirm the changes, OK.

11. For a final increase in the readability of the image, you can add a layer with test points and sign them with the appropriate cesium concentrations in the soil (similar to the layer) izolinie_Cez) The result of the work is shown in Figure 4.

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