Selected Methods of Spatial Analysis of Soils of Azerbaijan

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Introduction

Figure

Spatial analysis in GIS Wednesday is based on complex techniques, the results of which depend on the raw data.

One of the fundamentals of spatial analysis techniques based on digital hypsometric model is the development of maps of the angles. She gained widespread use, from morphogenetic and geological-engineering perspective to the agrarian and territorial planning.

Progress of research and discussion of materials

Program ArcMap provides the ability to quickly prepare this type of cards based on raster model hypsometric territory.

To calculate the slope of a surface that is specific to a particular screen, used values of absolute height, raised eight surrounding screens (Figure 1).

The calculated values of the two parameters (α and (b)), proportional average slant of slope (respectively on the x and y axis) according to the following formulae:

$$\alpha = (h_3 + 2h_6 + h_9 - h_1 - 2h_4 - (h)7)/8L \quad (1)$$
$$(b) = (h_1 + 2h_2 + h_3 - h_7 - 2h_8 - (h)_9)/8L$$

Where is:

$(h)_1$ = the absolute height of the surface of the territory in (i)-OM image according to figure 1.

L = raster measurement.

Figure: 1

The angle of the slope, plant in the central point is calculated as:

$$\tan \alpha = \sqrt{a^2 + b^2} \quad (2)$$

1. In the menu Spatial Analyst pick Surface Analysis, then Slope that will lead to opening the window method.

2. With list boxes Input surface Choose created a digital model of the hypsometric of Azerbaijan.

3. The main unit can be marked graphs slope measurement slope on the resultant map-in variant degrees (Degree) or as a percentage (option) Percent.

4. Graphs Z Factor and Output cell size perform the same role as in the Hillshade. Leave them automatic size.

5. In the graph Output raster point localization and name of the source file, then- OK.

6. After completion of the analysis of the source layer appears in the map image.

Change the layer display mode according to the technique described previously.
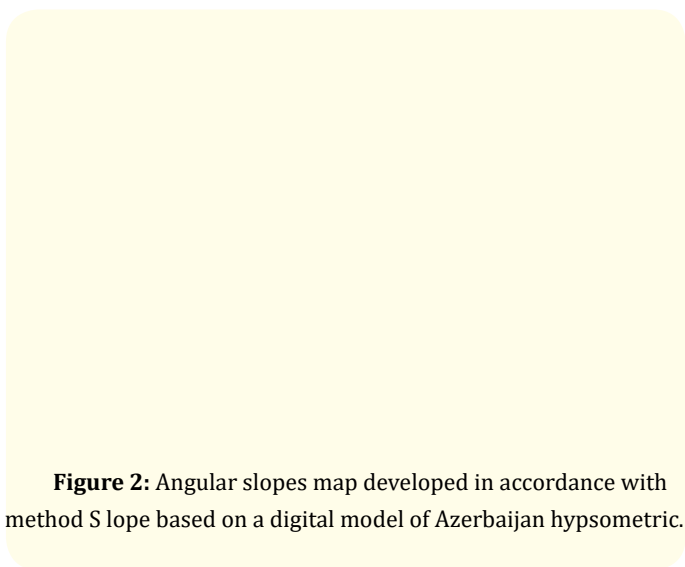
The final effect should be similar to figure 2.

Figure 2: Angular slopes map developed in accordance with method S lope based on a digital model of Azerbaijan hypsometric.

Change the layer display mode according to the technique described previously.

Under slope Exposition, understand the direction (azimuth) slope steepness of most to the sides of the horizon.

This option is very important for those kinds of analysis that takes into account the difference of thermal balance of the northern and southern slopes.

This is the initial value for aspects such as the time of occurrence of snow cover duration of vegetation period etc.

The method of calculation is similar to the method Slope. It also used high-altitude data from screens placed in the immediate vicinity of the Central screen, for which the calculation of parameters (a) and (b) (in accordance with identical formulas).

Exposition of slope is calculated as:

$\tan ß = a/b$ (3)

If (b) positively, the largest ß necessary Add 180^0, that allows to take into account the magnitude of the azimuth from 0 to 360^0.

1. In menu Spatial Analyst choose a Surface Analysis, then Aspect-method dialog box appears (Figure 3)

2. In box Input surface traditionally make the filename digitally hypsometric model.

3. In box Output cell size leave unattended.

4. In box Output raster denote localization and name of the source file, click OK to start following their completion, payments to the image will be added effective map. After you change the display card is similar to figure 3.
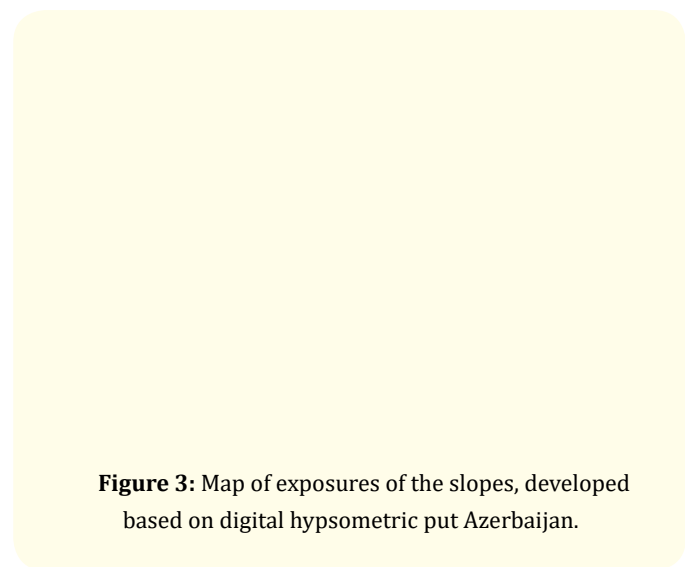

Figure 3: Map of exposures of the slopes, developed based on digital hypsometric put Azerbaijan.

Next, consider the way to an integrated spatial analysis based on raster maps. For example, suppose you want to select a specific localization hypothetical potential investments on the territory of Azerbaijan.

Investor demands that the investing territory meets certain conditions.

First, the angle of the slopes in the territory's investment should not exceed 10^0.

Secondly, the investment should be within the absolute height of surface from 100 to 500 m.

Using GIS and digital hypsometric model of Azerbaijan (with derived layers), the definition of localizations of this investment takes a few minutes.

In menu Spatial Analyst toolbar Select position Raster Calculator. A dialog box appears, represented in figure 3.

In the left part of the window, in the Layers highlighted all raster layers project. With right sides are mathematical logical operators that can be used for entering formulas.

The formulas are based on arithmetic operators, and the results have a numeric expression. For example, if you want to double increase digital hypsometric model, it is possible to formulate a simple expression:

[CGM] * 2 (3)

where instead of CGM, you must enter the name of the selected raster layer surface model.

As a result of this operation received a raster map, where each point in discrete space is assigned a numerical value, which corresponds to doubling the height of the territory. Such arithmetic operations can be applied to other sectors.

For example, having a layer of embossed field precipitation, as well as layer with spatial distribution of filtration coefficient, obtained by multiplying the two layers you can obtain the spatial distribution of effective infiltration of precipitation.

Often also used the differencing method. In this way, create a differential maps that document the temporarily-spatial variability of the investigated phenomenon.

For example, as a result of the seizure of average precipitation from the actual over the past two years, it is possible to define the territory increases and regression of this phenomenon.

Use this type of expression to identify the territory within Azerbaijan, which satisfies the conditions of investra.

First define the territory where the inclination does not exceed slopes 10^0.

This requires the formulation of the next task

[Slope] < = 10. (4)

Where on the graph Slope you must submit the name of a bitmap layer with angles of inclination of slopes.

Formulation of issues using Windows Raster Calculator is simple enough:

1. In the graph Layers Select the name of the layer with the angles of inclination of slopes. Note that added layer automatically enclosed in quotation marks.
2. Of the symbols of the operators choose < =. This results in adding this element to the expression.
3. Using digital signs in a window or on the keyboard, type 10 in the end of the expression.
4. The formula is ready, you can go to do so. Evaluate.

Upon completion of the calculations in the working area of the project will add a new layer using the program Calculation. Layer is only with greatness.

Screens marked digital 1, satisfy the conditions of maximum slope slopes up to 10 largest. Now you must select the area that meets the requirements of investra for its absolute height. To do this, construct the following expression (5):

[CGM] > = 100 and [CGM] < = 500 (5)

On site CGM enter the name of a raster layer with digital hypsometric model territory. For formulating expressions use window Raster Calculator.

1. In Windows Raster Calculator Select layer with digital hypsometric model of Azerbaijani territory in the graph Layers.
2. press the key with the operator > =
3. Enter the value 100
4. Push And
5. Again click on the layer name in the CGM graph Layers.
6. Push the button with the < = operator
7. Enter the value 500
8. Check the correctness of the formula and select Evaluate.

The result of the calculations is a raster layer named program Calculation 2 similar *to* the previous layer here showing screens marked cifroj1 that identify the territory, where high-rise relevant criteria. now you must connect both layers to define the territory corresponding to two requirements-surface height and tilt. Use the method the Raster Calculator.

1. Press twice on the layer Calculation in the graph Layers.
2. Select the = operator
3. Enter the value 1.
4. Choose the logical operator And
5. twice click on layer Calculation 2.
6. Select the = operator
7. Enter the value 1.
   The final expression must be of the form:
   [Calculation] = 1 & [Calculation 2] = 1
8. Click on Evaluate. In the working area will be added a new layer with the designated (red) territory, which satisfies the requirements of the investor (Figure 4).

Figure 4: Result of the spatial analysis to define the territory of Azerbaijan, the relevant requirements of the investor.

The resulting image points to a very extensive array, located in the foothill zone of Azerbaijan. It is clear that in such a large territory does not satisfy any investor to potential localization object.

In this regard, you can narrow the boundary parameters of each criterion. For example, the choice of the territory where the inclination does not exceed 1 degree.

In the analysis process can also take into account additional criteria, such as location, investment plot at a distance of not less than 500m from the nearest coastline and 1000 m from the urban areas.

The possibilities are endless and depend solely on the needs of the user of GIS and spatial information availability [1-17].

Bibliography

1. Alekperov ka. "Pochvoezionnaya map and land protection". Moscow (1980).

2. Aliyev BH and Aliyev ZH. "Aliyev 8452 and erosion Problems in Azerbaijan and ways of its solution". IZD-vo Zia-CPI "Naji. with 12 (2000).

3. H Aliev and Aliev ZH. "Zoning of the territory of Azerbaijan Republic on choosing advanced irrigation techniques". Monograph, Publishing house "Ziya". Baku,(2001): 297.

4. Bonham-Carter GF. "Geographic Information Systems for land resources assessment". Larendon Press, Oxford (1994).

5. Berry K. "Mar Ayalesis". Procedures and Application in GIS Modeling BASIS Press. (book on line http/www.Innovativegis. Com/basis/MapAnalysis/) (2006).

6. Wang F. "Quantitative Methods and Application in GIS". Taylor and Francis, Boca Raton, London, New York (2006).

7. Webster R and Oliver MA. "Geostatistics Scientists". John Wiley and Sons (2001).

8. Clarke KC. "Analytical and Computer Report". Prentice Hall (1995).

9. Dm eMers N. "GIS modeling in raster". John Wiley and Sons (2002).

10. Litwin Lg. "Myrda Systems Informacji Geograficznej". Helion (2005)

11. Isseland TM and Kiefer RW. "Remote Sensing and Image Interpretation". John Wiley and Sons, New York (1994).

12. Longley PA., et al. "Geographical Information Systems: Principles, Techniques, Management and Applications (abridged edition)". Hoboken, n. j. Wiley (2005).

13. Longley PA., et al. "Geographic Information Systems and Science, 2nd Edition". John Wiley and Sons (2005).

14. Tomlin CD. "Geographic Information Systems and by modeling". Prentice Hall, New Jersey (1990).

15. Jacek Urbanski. "Zrozumiec GIS". Analiza Informacji, Wydawnictwo Naukowe PWN przestrzennej (1997).

16. Jacek Urbanski. "Modelowanie kartograficzne strefy brzegoej morza". Wydawnictwo Uniwersytetu Gdanskego (2001).

17. Urban Training Manual-GIS in studies of nature (2012).

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