

## ON THE CLASSIFICATION OF AGRICULTURAL LANDS

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### **Abstract**

*The technique of recognition of the certain forms of a relief on digital model is offered. Image recognition is carried out with the purpose to determine an allocation of the surface relief forms, which can be used for agricultural lands. The results of recognition of guided slopes of mountain district on the data of digital elevation model are given.*

The earth surface relief is investigated not only as an independent object, but also as one of the basic elements of the ecological system. There is a problem of algorithmization and automation of the morphometric works, which is formulated in [1,5]. Solving of this problem will allow to carry out morphometric data processing in a real time scale.

The last years publications, which concern researches of earth surface relief, show, that computerization of all branches of the national economy with the purpose of improving the efficiency of there management is necessity in everyone civilization society. Therefore digital information on the locality provides both making appropriate decisions, and control over their being put into effect.

The economic feasibility of modern scientific technologies is beyond any doubts. For their implementation it is necessary to solve a lot of scientific and technical problems, that eventually will guarantee realization of lands reform, management of land tenure and monitoring of lands. The second essential necessity in mentioned technologies is quick making of the administrative decisions, analyzing of circumstances and resource management in extraordinary situations.

The development of information systems of various purpose is of nation-wide importance. First of all it concerns to GIS as to the tool for use of cartographical funds and solving economic issues. Computer technologies have changed the principles of researching the relief of the earth surface.

Here are the following peculiarities of studying of the numerical characteristics of the certain forms and types of relief, or modern morphometric of researches: orientation to solving

urgent economic tasks, first of all ecological ones, development of a shelf, agricultural issues etc.; use of achievements of remote sensing and computer devices.

The success in agriculture to a great extent depends on the correct consideration of natural conditions of territories. Since the use of identical methods on various areas is not effective. It is necessary to set special conditions of land nature for regions with the sharply conspicuous relief, where soil erosion is possible.

The relief first of all should be taken into account while regulating superface waterflows, at developing measures to prevent soil erosion, to restore their fertility and economic value of washed off and ashed soils.

No other property of land as means of production influences its other characteristic so strongly as a relief. Not only character and quality of soils, but also term of their use for an agriculture and also influence on the earth surface of the sun, atmosphere and precipitation depend upon relief, its forms and elements.

As the geological phenomena essentially manifested themselves in relief it is possible to judge upon it relive the processes, which can be useful or harmful for the agricultural use of territory. First of all this concerns planning melioration work. Hence in agro-production division of territories the relief of the earth surface will play a rather essential role.

The method of relief plastics widely used in the process of soil mapping, for it is known from literature, that there is topological dependence between relief and thickness of soil, besides the relief is the leading and organizing factor or component of a landscape. He directly or indirectly redistributes all landscape components, dependent on, and also influences changes in the climate, its differentiation, that also plays essential role in agriculture.

Each form of a relief is unique both in time and in space. However due to comparison it is possible to separate similar groups and to classify according to their essential attributes. In geographical sciences the given classification is called zoning. The criteria for zoning depend on purpose. It can be physical-geographical, nature protective, agricultural etc. Among natural branch zoning of territories, geomorphological on which will be described in details.

The basic stages of realization such zoning are the following: defining the optimum elementary site for zoning and establishing the hierarchy; selecting the attributes for topological zoning and last stage is grouping the regions by purpose chosen. Geomorphological zoning is at its initial stage of development.

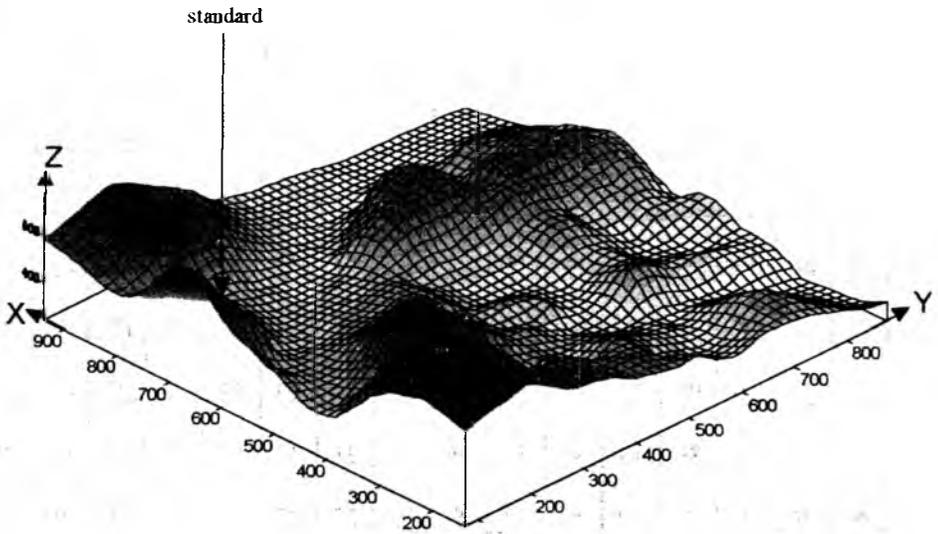
Though the relief of the earth surface is most stable in comparison with a climate, ground vegetation covering. However the forms of the earth surface, as morphological elements, the set of which is considered as invariants, frequently are connected with each other and are not precisely expressed. Just because of that, the given problem, as it has been said in [3], in spite of its simplicity, has not been solved yet.

In [3] it is mentioned, that for the purpose of soil studying in USA there have been singled out scrtain forms of the earth surface were used: plain, plateou, slope, hill, valley. As to the use if the analytical methods, offered by author [4], there arises a question of

quantitative criteria for the estimation of accuracy of the executed classification or recognition of the chosen forms.

This problem can be solved in the author's opinion, only by visual comparison of the classified or recognized objects with the chosen standard. Though such estimation can be rather subjective, it can be overcome only by the same experiments other researchers.

The results of recognition of slopes by the technique given in [2,4], are presented in table.



Pecture. Relief emage



For the aim of the experiment the relief of the earth surface was shown with digital elevation model by the heights in regular grid crosses. In his previous works the author gives the theoretical aspects of using of images recognition for the purpose of classifying the sites of the earth surface depending on the forms of a relief.

Process of making decisions in image recognition is considered as a statistical. The values of decision function in the cells of the table correspond to the form of the relief in a 3x3 sized window of the crossings of a regular grid. The slope of a specific orientation, have been chosen for a standard. In the table the value of decision function for the standards is zero.

Similarity of objects to the chosen standard is defined by the values of decision function. The choice of the value of this function also is established by the developer of automatic system.

The values of decision function which exceed a third part from the maximal in the table are underlined. It is possible to consider, that forms of relief, which get in the given windows, similar to the standard.

Decision function put vector  $x$  to one of  $M$  classes. The decision function will be optimum if exists the least probability of a mistake for all  $x$ . The system of recognition  $R1$  is better than  $R2$ , if probability to be mistaken for system  $R1$  is lower than for system  $R2$ . The system of recognition is mistaken, if it classifies the object as that of class  $B$ , belongs to a class  $A$ . Hence the best there will be an automatic system of recognition, which has smaller probability of mistake. Therefore the table contains the values of all decision functions for all objects, that is in the windows, with the help of which the surface was scanned.

Рецензію на статтю виконав професор, д. т. н. Дорожинський О. Л.

**Literature:**

1. Берлянт А.М. Использование карт для целей прогноза. // Картография - Итоги науки и техники. Т. 7. - М., 1976. - С. 22-36.
2. Дж. Ту, Р. Гонсалес. Принципы распознавания образов. – М. Мир, 1978. 411с.
3. Ласточкин А.Н. Рельеф земной поверхности (принципы и методы статистической геоморфологии) – Л.: Недра, 1991. – 340 с.
4. Рудий Р.М. Виділення об'єктів з цифрової моделі рельєфу з використанням теорії розпізнавання образів. // Геодезія, картографія і аерофотознімання. - 1997. - №58. - С. 207-212.
5. Sharif, M. Terrain Morphology Modelling. International Archives of Photogrammetry and Remote Sensing – 18th ISPRS Congress, Vienna, Austria, 1996. Commission 3, pp 792-797.

**ПРО КЛАСИФІАЦІЮ СІЛЬСЬКОГОСПОДАРСЬКИХ УГІДЬ****Р.М.Рудий****Анотація**

*Пропонується методика розпізнавання певних форм рельєфу за цифровою моделлю. Розпізнавання образів виконуються з метою визначення форм рельєфу земної поверхні, які можуть бути використані для сільськогосподарських угідь. Приведені результати розпізнавання певних схилів гірської ділянки місцевості за даними цифрової моделі.*