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Constructions of vegetation cover cartographical models based on remote sensing information and traditional maps.

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Construction of models of vegetation based on remote sensing information is actually a problem of classification of remote sensing information.
Each pixel in the classification procedure applies to one class of vegetation. These classes can be initially defined by the values of variables (channels, indexes, etc.), or can be obtained during the procedure.
If the problem is solved on the basis of the training set, i.e. classes are originally specified, then arises the question of the representativeness of the sample. If the classes and their spatial distribution are obtained in the classification process, there is a problem of physical interpretation of the classes.
The proposed technique is one of the options for addressing the problems described above.
For many territories, there are maps representing the structure of vegetation and associated characteristics.
These maps are a generalization of the expert opinion of the authors, a large array of field descriptions, interpretation of aerial photographs. Depending on the scale, such maps have varying degrees of accuracy and generalization, for example, small-scale maps reflect the structure of the phenomenon described in very simplified form. However, any high-quality map, in general, correctly, at the appropriate scale, reflects the phenomenon described. Thus, you can use these maps as a training sample covering the whole modeling territory. Using the traditional maps, we use the data accumulated over many years of research in its spatial form. This approach gives us a pre-defined types of modeled phenomena and provides a greater variety of manifestations of these types, than, for example, a few reference points derived from the field observation.
Kernel of the method is based on the following sequence of procedures:
1. Map, remote sensing information and its derivatives are combined into one database.
Elementary unit of such a database represents a pixel, which has the geographic coordinates and has a size corresponding to the scale of the model. A pixel is considered to be homogeneous and the values of variables included in the analysis are attached to it.
2. Discriminant analysis of the studied variable is performed on the basis of the database. Each pixel is re-classified and assigned to the most probable type of phenomenon. The output contains: the axis of discriminant analysis, a new map of modeled variable and a map of model's definiteness.
3. Map obtained in Step 2 may contain only the original classes, but in the investigated area classes not initially listed on the original map may exist. To increase the diversity of classes
the method of stepwise iterative dichotomous classification is applied. This method at each of its iterations generates the number of classes two times greater than in the previous iteration. Thus, on the first iteration the entire set is split into two classes, then each class is divided by two, and so on.
This algorithm is used on the set of values of the axes of discriminant analysis, and generates classes which are independent from initial classes.
4. The physical meaning of classes obtained in step 3 is determined through the distance (in the selected metrics) between them and the classes obtained in step 2 in the field of axis.
Some classes may not be interpretable on the original set of types. These classes require additional research. Each pixel has a value of model's uncertainty.

An important feature of the method is the possibility of a coherent transition from one scale to another, ie the construction of large-scale models from small-scale. There is also the possibility of retrospective analysis and study of the dynamics of the simulated phenomena through the use of remote sensing information through different

periods and maps of different years of issue. The obtained axis of discriminant analysis can be considered as order parameters of the model and these parameters can be interpreted physically. The values of these parameters are known for each class, and we can construct the dynamic model based on these parameters.

Thus, the proposed method generalizes the modern and the old sources of data and provides researchers the opportunity to build models of vegetation, or other mapped phenomena basing on the huge amount of prior information at minimal cost.