ANALYSIS OF THE MODERN CONDITION PROBLEMS OF THE RECOGNITION AND CLASSIFICATIONS OF THE MODELS ALGORITHM MONITORING NOT ENOUGH STUDY DEPOSITS

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Summary

In given work on base of the analysis of the modern condition problem of the recognition and classifications, shall consider to models, methods and algorithms, allowing process the greater arrays to information for study perspective place of birth on territory of the republic Kazakhstan.

In applied study use the different methods to classifications and artificial perceptions. Particularly broadly they are used in geoinformation technology. In foreign country GIS-technologies long ago develop and are created popular GIS-systems, as ARC/INFO, ArcCAD, ERDAS, ArcViev, ERDAS, WinGIS, AtlasGIS, SpanGIS, RADARSAT. Work are In Kazahastan also on creation geoinformation systems. In particular they find using in following sphere: guard surrounding ambiences, geology, cosmic studies, geophysics, geodesy and cartography, rural and timber facilities and others.

The analysis of the applied problems information handling has got practical spreading to following models.

1. The models of the calculation estimation (voting, G-models). This approach is offered at the beginning initially 70 years YU.ZHuravlev and has hereinafter got the development in his work and in work his Kazakhstan pupil.
2. The algebraic models in artificial perceptions. This approach is founded on use the device and methods discrete mathematicians, algebras and mathematics of logic algorithm of searching for dead-end test (the elementary qualifier, "information fragment signing of the descriptions").
3. The models of the problem of the recognition and classifications, founded on group decisions, got by way to reliability algorithm recognitions and classifications, but idea possible to attract not one, but several solving function. Here possible select work of A.Rastrigin, R.Erenshteyn, where is expected method of the syntheses of the group solving rules, founded on determination of the areas their "competence".

The known work Kazakhstan scientist E.Zakarin, E.Amirgaliev, A.F.Muhamedgaliev, L.Spivak in which explored different methods of the syntheses of the group decisions by committee algorithm to classifications. They are considered structured and metric bases of the building of the group decisions in problem of the recognition and classifications.

The got results are due to developments and modification of the following models of the recognition and classifications: 1) to statistical models, 2) to models "neuron networks" in artificial perceptions, 3) to hierarchical models in problem of the classifications, 4) to models, founded on method potential function, 5) to models, founded on use the principle of division (R-models), 6) to models, founded on calculus of the utterances, in particular on device of the algebra of the logic (L-models).

The methods of the artificial perception are broadly used for analysis of the given remote flexing, got by means of cosmic device in the manner of digital scenes. Such picture present itself given exceedingly high dimensionality. For modelling "cloud" point in space sign monochromatic scenes is used big set of the mathematical facilities: from Markov's models before methods of the algebraic topology.

The modern sensors cosmic device allow to reach the greater spatial permits. These scenes name High resolution (HR) images. They contain information on terrestrial landscape, which allow to see the ensemble of the small scenes.

The first at a walk analysis of the digital scenes is a separation interesting us object from background i.e. segmenting. To this effect exists the ensemble an approach. But their efficiency depends on concrete problem.

Finding multifracial characteristic of the scenes has brought about creation multifracial formalism, which allows successfully to solve the problems to classifications and artificial perceptions for such data.

The base of this approach is a separation from picture some fundamental component - an singularity variety. Each of component has its factor "intensities of the measure", allowing correct to take into account the local characteristic different area scenes. Information, being kept in scenes introduces in sedate factor of brightness or contrast.

In recently are often used such methods multifracial formalism, as building of the measure for scenes at exponent of Gelder and capacities of Shocke.

In our event by the most best approach is a method of the use exponent of Gelder. We shall mark the field to brightness of the digital halftone scene as $I(\vec{x})$, where coordinates pixel belongs to the all-numerical lattice: $\vec{x} \in Z^2$. Below under point $\vec{x}$, depending on context, are understood or coordinates of the centre pixel, or pixel itself. Comfortably to work with detours from average value level "sulphur", counted for whole scene i.e. with global floor contrast, which is defined as

$$c(\vec{x}) \equiv I(\vec{x}) - I_0, \tag{1}$$

where I_0 is average brightness on the whole scene. Thereby, average with $c(\vec{x})$ on the whole scene is a zero.

Exist several equivalent ways to make sure in existence multifracial structures [3]. One of the possibilities consists in building of the measure μ for each ensemble $A \in I$ [3, 4]. Its possible define through density $d\mu(\vec{x})$ as follows:

$$\mu(A) \equiv \int_A d\mu(\vec{x}) \ . \tag{2}$$

In offer of local smoothness, shall define density of the measure as

$$d\mu(\vec{x}) \equiv |\nabla c|(\vec{x}) d\vec{x} \,, \tag{3}$$

where ∇c is a gradient contrasting (1), but sign of the module provides positive measures. The measure μ gives the belief about local sharing the gradient with and its spottiness within scene.

Possible use this circumstance to characterize the contents any ensemble, including pixel $\vec{x}$. We shall mark through $B_r(\vec{x})$ ball radius r with the centre in point $\vec{x}$. The measure μ is an multifracial if each point μ in scene possible to characterize local for small values r by means of Gelder's exponents $h(\vec{x})$as [5]

$$\mu(B_r(\vec{x})) = \alpha(\vec{x})\, r^{d+h(\vec{x})} + o(r^{d+h(\vec{x})}), \tag{4}$$

where $o(r^{d+h(\vec{x})})$ marks the members of the more high order to small sizes than $r^{d+h(\vec{x})}$ and d=2 - topological dimensionality of the carrier of the scene. For multifracial of the measure equation (4) uniquely defines the factor $\alpha(\vec{x})$) and Gelder's exponent $h(\vec{x})$: they can be received by means of linear regression $\log_2\mu(B_r(\vec{x}))$ vs. $\log r$. The factor $\alpha(\vec{x})$ depends on choice of the metrics, using for determination ball B_r and scale for r, and, thereby, does not carry no information on scale dependency. Opposite, the exponent h($\vec{x}$) does not depend on metricses and gives whole information on evolutions at zoom r.

In practice reception estimation factors singularity, founded on formula (4), more difficult because of impossibility of the unceasing change the values of the radius for discrete scene r. So often use wavelet projection of the measure [5].

Let Ψ is maternal wavelet, satisfying condition to admissibility [5]. We shall define wavelet transformation $T_\psi \mu(\vec{x}, r)$ of the measure μ by means of function Ψ in point and on scale r as

$$T_\psi \mu(\vec{x}, r) \equiv \int d\eta(\vec{y}) \frac{1}{r^d} \psi(\frac{\vec{x} - \vec{y}}{r}). \tag{5}$$

Possible prove that sedate law comply with for multifracial of the measures wavelet transformations $T_\psi \mu(\vec{x}, r)$ in ball B_r, as follows,

$$T_\psi \mu(\vec{x}, x) = \alpha_\psi(\vec{x}) r^{h(\vec{x})} + o(r^{h(\vec{x})}), \tag{6}$$

where $h(\vec{x})$ same that in equation (4), but $\alpha_\psi(\vec{x})$ depends on choice Ψ. Now, factors degree $h(\vec{x})$ are got as slopping linear regression $\log T_\psi \mu(\vec{x}, x)$ versus log*r*, where values r are changed continuity.

Existence multifracial measures entails the certain strict hierarchical organization in scenes. Scene is split on different components multifracial decompositions K_h, which contains points, having same factor of singularity h:

$$K_h = \{\vec{x} : h(\vec{x}) = h\} \tag{7}$$

"Size" each of component is defined its Hausdorfov's dimensionality

$$T_\psi \mu(\vec{x}, x) = \alpha_\psi(\vec{x}) r^{h(\vec{x})} + o(r^{h(\vec{x})}),$$

or capacity. The vapour(pair) (h, f_H) name the multifracial by spectrum.

In work [1] for numerical estimation to dimensionality D(h)≈ f_H(h) component K_h is offered use box-dimensionality, connected with log-Poisson's multifractal, for which

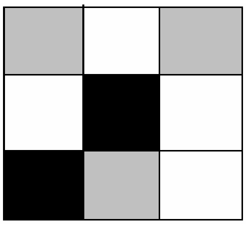
$$D(h) = D_\infty + \frac{h - h_\infty}{\gamma}[1 - \log(\frac{h - h\infty}{\gamma(2 - D\infty)})]. \tag{8}$$

Here $\gamma = -\log[1 + h_\infty / (2 - D_\infty)]$, h_∞ is a minimum value Gelder's exponents, got for scene, and $D_\infty = D(h_\infty)$.

When use wavelets for estimation Gelder's exponent value h_∞ usually negativly. In scaling for measure (4) factor d+ h_∞=2+ h_∞≈1 so D_∞≈1 correspond to the point of the scene, rest upon sidebar. So, components K_∞=K h_∞ name the variety maximum singularity (Most Singular Mnifold - MSM). It plays the greater role in multifracial of the reconstructions of the scene [1]: it appears that MSM is a skeleton of the scene, which allows, in correspond with hypothesis of Mar, restore the source picture if each point of the skeleton complete pixel of the source scene by means of simple propagator [6]. Practically obviously that MSM is refined by variant to soft segmenting.

Regrettably, not always manages well to define the gradient. Really, gradient calculate on numerical scene by means of operator of Sobolev usually, using differences level sulphur between pixel. In the numerical method, at reduction of the size to vicinities, well determined differential operator must demonstrate to say the least monotonous behaviour at reduction figures radius to vicinities. However, this does not manage to obtain for scenes with high variety. As a result possible receive false values of exponents. That to avoid this difficulty we use as measures so named capacities Shocke. They are a generalization of the measure with weakening of the condition to additivity and the known from quasi-base to theories.

The exponents of Gelder allow to distribute the scene on uniform components with fixed values of local regularly, and not always allow well to define the gradient. So as measures better to use the capacities of Shocke. Their using instead of usual amounts "level sulphur" allows to avoid to difficulties, connected with correct determination of the local factors singularity. The numerical algorithms allow to get the firm estimations an exponent without use wavelets projection even. Consequently, greatly decreases labour content of the calculations and time of the processing the scene.



a)

$$\begin{pmatrix} 25 & 0 & 27 \\ 0 & 255 & 0 \\ 254 & 25 & 0 \end{pmatrix}$$

б)

Picture1. Fragment of the scene 3x3 (but) and numerical values level sulphur in pixel (b)

We shall bring the following example. On picture 1, *a* is shown area Ω, on picture 1, *b* is corresponding to this scene numerical values $I(p)$. Here capacities of Shocke are: $\mu_{max}(\Omega)=255$, $\mu_{min}(\Omega)=25$ (zero values are not considered). For $\delta=2$ equivalent comparatively central are two pixels: with value 254 and itself central - 255. Consequently, $\mu_{iso}(\Omega)=2$.

Using incorporated capacities, possible get the direct estimations Gelder's exponent $\alpha_{\max}$, $\alpha_{\min}$ и α_{iso}, as sloppings of the rectilinear area graph $\log\mu(V_i)$ vs. $\log(i)$, where V_i is a square ixi pixels $i=2n+1$, $n=0,1,2,\ldots$ multifracial analysises of the landscape were organized by means of said methods, containing deposite Akbay and Tengiz.

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