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THE NEAREST NEIGHBORHOOD OF PERCOLATION CLUSTER'S ELEMENTS AS COMPLEX SYSTEM'S PROPERTY INDICATOR

The algorithm for determining the Lévesque measure on the set of "conductive" sites of the nearest neighborhood and the algorithm for calculating the dimension of describing the scaling behavior of their division's entropy is designed in the evolution of nearest neighborhood model; the set-theory description of percolation transitions in the continuum and fractal arrays was given; the idea of the relative degree's order of the structure was introduced, the suitability of this value to evaluate the drift of the nearest neighborhood properties is shown.

In recent years, concepts and methods of percolation theory are used effectively in natural and engineering sciences such as biophysics, theoretical chemistry, materials science, network technologies and other. It is interesting to watch that the percolation theory more clearly manifests itself as an interdisciplinary knowledge and a conception of the connectivity (in the broad sense) reveals traits of general scientific concepts.

The nearest neighborhood of percolation cluster elements conception allows significantly extend theory's features in detailing of the generation processes and at the cluster systems research [1-3].

In the proposed approach, the nearest neighborhood, in fact, is itself a percolation field in n-dimensional space properties that allows to increase the number of parameters cardinally which describe the state of the percolation clusters elements and increases conditions variability of their association in the process of clustering. Perhaps, in a short time, this will make the nearest neighborhood one of the key components of percolation models.

One aspect of the model is to consider the nearest neighborhood like set belonging to the class of "thick" fractals.

In addition, the model suggests that each site of percolation problem can be defined as a region of finite size in which, in its turn, possible to solve a percolation problem, et cetera. Those sites are simulated as Sierpinski gasket of arbitrary generation, which depends from prescribed accuracy. In the model, authors determined centers of the "sites" locations by a random number generator, and used uniform distribution generator (in variant of the model – the Gauss distribution).

It is well known that the Sierpinski gasket can be considered as the two-dimensional Cantor set. Let is two-dimensional Cantor set of the two-scale s_1 and s_2, with a measure generated by a multiplicative process p_1, p_2. Since we have $n!/k!(n-k)!$ segments of space $s_1^k s_2^{n-k}$ and weight $\mu_i = p_1^k p_2^{n-k}$ in the n-th generation of the Cantor set. So measure given by

$$M_d(q,\delta) = (p_1^q s_1^d + p_2^q s_2^d)^n = (p_1^q l_1^{2d} + p_2^q l_2^{2d})^n,$$

where δ is the same box size on all cells used to cover the set; and q – the moment order of M. For $q = 0$ the mass exponent is the fractal dimension of the set, and equals 0.6110…

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