

REVIEW
of the graduation project by Nikita .V. Meyer
titled “Modeling of the percolation process”

Bachelor's thesis by N.V. Meyer is dedicated to one of the problems of percolation theory - the estimation of the average number of clusters on a random lattice with a given probability of node filling. A number of rigorous mathematical results have been obtained in the theory of percolation but the main progress has been made in the use of computational methods. Those methods relate to Monte Carlo methods which implies the simulation of a large number of lattices with given parameters with the subsequent estimation of the desired value, which is a characteristic (most often a mathematical expectation) of a random variable. In the work of N.V. Meyer the average number of clusters of a two-dimensional lattice is estimated by repeated modeling. It indicates the correspondense between stated topic and the content of the work.

The thesis has a well-organised structure and contains an introduction, a chapter with a brief statement of the problem, a chapter describing the known Hoshen-Kopelman algorithm, a chapter on improving this algorithm in terms of reducing variance, a chapter dealing with a wider class of measures, the interface of the program used for carrying out numerical experiments.

N.V. Meyer focuses on the consideration and improvement of the Hoshen-Kopelman algorithm. To reduce the variance the author introduces a new random variable depending on the parameter with the same mathematical expectation as in the Hoshen-Kopelman algorithm. Then a parameter is chosen using the algorithm proposed by the author, so that a significant decrease in the variance is observed in comparison with the estimate obtained in the basic algorithm. The proposed method is accompanied by a number of numerical experiments demonstrating its comparison with the basic Hoshen-Kopelman algorithm.

The presence of impressive luggage of past studies and a considerable number of new article dedicated to the theory of percolation clearly demonstrates the relevance of the chosen topic and the potential practical significance of the studies conducted in the graduation project. All the results described in the project are provided with necessary references to printed publications, which indicates the work done to study the available literature on the theme of the study.

The results of the thesis are well-formulated so one can judge about main goals of the thesis.

Despite the fact that the work is written in good technical language and the presentation is given clearly and consistently, the work of N.V. Meyer is still not free from shortcomings, which include a number of typos and technical inaccuracies:

- In the text there is no reference to Figure 1;
- In the first chapter, there is no formal definition of neighboring nodes;
- Page 12 In the expression for the sample variance there is lack of square on the right-hand side;
- Page 8, item 4. The extra sum sign is used.
- Despite the fact that the basic algorithm is the Hoshen-Kopelman algorithm its description is given concisely without describing the process of marking the nodes.

The strengths of the work should certainly include the number of illustrations that simplify the understanding of the material, as well as convenient access to the code of numerical experiments, despite the lack of comments.

The graduation project of Meyer titled "Modeling of the percolation process" is an academically finished work, it contains useful results for applications of the theory of percolation and deserves an "excellent" mark.

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