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Numerical method of the decision of extreme tasks in the class of nondifferentiable functions

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ABSTRACT

The given work is devoted to research on extremum of nondifferentiable functions.

In the theory of optimization of nondifferentiable functions of research, in many respects, are based on the concept of a gradient. It is known, that the gradient of smooth function determines a direction of its quickest increase and is equal to zero at the point of extremum. These important properties also have formed the basis for construction of various numerical methods of optimization of smooth functions.

The task of search of extremum is complicated considerably at transition to the continuous, but not everywhere nondifferentiable functions. And for this functions the gradient exists not in every point of its definition. The carried out researches for the class of convex functions, have resulted to construction of the the generalized gradient or subdifferential for this functions. It allows to formulate necessary conditions of extremum of convex function, to find derivative on a direction in each point and to determine a direction of the quickest descent. It had enabled to develop various numerical methods for search of extremum of convex functions. The important role of subdifferential of convex function has induced many researchers to search of an opportunity of generalization of concept of subdifferential for wider classes of functions than class of convex functions. The most general results in this direction are received by F. Clarke [1].

The task of search of extremum becomes even more difficult if the researched function is discontinuous. In the work [2] on the basis of concepts of the approximation gradient and the approximation derivative the new methods of the analysis of extreme tasks—analysis of discontinuous functions—are created.

In the given report the discrete analogue of the approximation gradient is considered, its properties are studied, and the method of searching the extremum of nondifferentiable functions is offered.

References

[1] Clarke F.H. Optimization and Nonsmooth Analysis. New York, John Wiley & Sons, 1983.

[2] Batukhtin V.D., Maiboroda L.A. Discontinuous extremal problems. S-Peterburg, Gippokrat, 1995.

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