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Mathematical model of control points placing for monitoring polluting substances emissions in the atmosphere on the basis of the NP-full coloring graph task decision

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The considerable quantity of mathematical model of control points placing for monitoring polluting substances emissions in the atmosphere on investigated territory.

The mathematical model of control points placing is developed for monitoring of atmospheric air on the basis of the NP-full coloring graph task decision. The model has following assumptions: dispersion of investigated substance is subordinated to the normal law of distribution; there is an information on numerical values of concentration of substance in each cell on a map. As the entrance parameters of model act: quantity of cells into which the territory is divided; distinction between values of concentration of polluting substance for reference of cells to various clusters. Target parameters of the model are: numbers of clusters which each cell on a map concerns; an arrangement of points of the control in certain cells [1].

The offered mathematical model of control points placing is developed for monitoring of atmospheric air on the basis of the NP-full coloring graph task decision, differs from analogues that the model can work with maps in the size to 100×100 and more cells, while analogues – with maps in the size about 50×50 cells. Besides, calculation speed on the developed model approximately twice above higher [1, 2].

The model differs also by the presence of additional restrictions on control points placing inside cluster, for prevention of points grouping in one place on a map whereas in model-analogue the points inside cluster settle down in a random way. The algorithm of a NP-full task about the minimum weighed covering of a matrix decision (known model) is more difficult, than algorithm of on the basis of the NP-full coloring graph task decision. It leads to that the calculation volume on the offered model is reduced more, than twice. However, application of more simple algorithm does not lead to the loss of accuracy of calculation results. The adequacy check of the model has shown, that the developed model allows to place adequately monitoring points for atmospheric air control of individual polluting substance in the allocated territory.

References

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