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The complex approach to estimate the flooding situation with resulting social and economic damages

Nikolai Sheshko, Alexander Volchak, Dmitry Kostjuk and Dmitry Petov

Brest State Technical University, Belarus

The complex of algorithms and software solutions for calculating the floodplain inundation zone during river floods is presented, which includes obtaining and analyzing hydrometeorological information with modern measurement technologies, probabilistic statistical prediction of the hydrographer shape, as well as using the results to predict the water level at control points of the river during the spring flood and calculate the expected flooding according to the forecast with estimating the relevant risks based on the territory urbanization and the economy use.

The proposed algorithm calculates the flood zone on the extensive river network using a cellular automaton, simulating the rising water distribution using a digital model of the river floodplain, represented by an elevation matrix; it provides both automatic conjugation of water surface models of different watercourses and ability to customize the effect of the water spreading for empirical consideration of the underlying surface. Proposed approach for prediction of the flood is based on the artificial neural networks usage for multivariate analysis of the following parameters: hydrological measurements of water flow in the river network, rainfall, and estimates of water content in snow cover in the catchment area of the river, obtained as a result of multi-band data satellite radiothermal measurements processing.

An approach to estimate social and economic damage brought by flood on the anthropogenically transformed territories is proposed as a finishing stage for the prediction system. The approach takes into account the usage level of the territory as well as the flood depth and duration. This way, the developed method and software which implements it can find wide adoption in city planning, insurance, emergency affairs response services.