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The use of modern information technologies for applied radiobiological research

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The study of radiobiological effects on the cell and organismal levels includes various procedures and approaches. The outcomes of such biomedical research are an essential task, primarily associated with computer diagnostics. We face with a need to analyze of a large number experimental data, save and store it as well as to have an opportunity of sharing with the members. The procedure for automatic counting of behavioral patterns and brain cells is a key step in the systems of behavioral analysis of videos and microscopic analysis of medical images of histological slides. In this regard, the main goal of the work is to develop effective methods for the automatic determination and quantification of behavioral patterns as well as brain cells based on modern methods of video/ image pre-processing, processing, computer view and modern approaches of artificial neural network.

One more reason is the difficulty in analyzing experimental heterogeneous data, which includes morphological data (images of sections of various biological tissues), behavioral data (video of experimental animals), etc., obtained by various groups of researchers. A complete understanding of the impact process and a qualitative picture of the effects of ionizing radiation on bio-systems require the systematization and simultaneous processing of a significant amount of these data relating to various aspects of the demonstration of the exposure. The use contemporary IT methods and approaches seem promising. The ordinary radiobiological study includes a set of methods to work with the laboratory rodents, behavioral tests, preparing biological samples, histological analysis, systematizing and analyzing experimental data, presenting data in a form convenient for complex statistical analysis. The outcome of the study is learning the basics of behavioral testing as well as histological technique and analysis, mark-up the dataset (videos/images), the systematization of the accumulated results, the identification of hidden patterns in the biological systems manifested in the response to the effects of damaging factors like ionizing radiation. Moreover, to solve the issues of storing, protection, safety-sharing data and algorithms as tools for analysis amount various information in a convenient framework, the Information System has been developing on the basis of the heterogeneous HybriLIT computing platform (JINR LIT), which has at its disposal both the means for developing such systems and the powerful computing resources of the Govorun. The automatization lets increase the speed and accuracy of complex processing of heterogeneous experimental data. Developing the system allows decreasing a chance of losing any information and having access from any place to continue work. Instead of buying software, we will have constantly technical support and change anything in either algorithms or storage by colleges at MLIT.

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