

USING DIFFERENTIAL COLOR MODELS IN LOSSLESS COMPRESSION OF RGB-IMAGES

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In the paper several methods of the determination of the optimal differential color model for the lossless compression of the RGB-images based on the predictors use are considered. Such optimal differential model allows the parameters of the compression of the context-independent algorithm to be improved.

The research topicality is based on the fact that the modern lossless compression formats of the RGB-images work with the pixels in the fixed color model. For example, BMP and PNG formats use RGB-model, the format of WinRAR packer uses the model R-G, G, B-G. But they do not use the possibility of the selection of the effective color model that can decrease the entropy as much as possible taking into account the correlation between different components of an image, presenting them as the data with geometrically and spacially similar structures. Thus, the goal of this paper is to describe and to prove the algorithm of building and using the alternative differential color models with non-adaptive predictors in lossless compression formats of RGB-images.

In this publication the algorithm for the determination and the use of the differential color model with the integer coefficients is shown. The efficiency of it is proved and confirmed by experiments.

Research conclusions:

1. The compression rate of the images based on the three-components color models can be improved not only by the correlation of the data of the independent components, but by the inter-components correlation as well.

2. If the non-adaptive predictors are used for the image lossless compression, the use of the differential color models will improve the compression rate at above 4.5 % in average. For natural images the compression rate can be improved at above 12 %. The effectiveness of the differential color models use for natural images increases with decreasing % of unique image colors. The building of the differential color models corresponds to searching the colors that have minimal energy of the color differences. In practice, it is best to use the differential color models with the integer coefficients. Although such models do not have the best compression rate, they provide the best coding and decoding speed.

3. Differential color models give a possibility to improve effectiveness of lossless compression of three-component natural images in formats that use non-adaptive predictors. Therefore, the models can be included into next versions of the formats as standards.

In the future, for obtaining better compression rate, it is planned to develop the algorithm of the image partitioning into areas of the same differential color models and the algorithm of compact storage of the areas.

Keywords – lossless compression, differential color model, predictors.