

Application of Evolving Artificial Neural Network for Image Processing

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A method of monochrome and colour images enhancement is concerned. The method is based on developed evolutionary algorithm (NEvA) for artificial neural network (ANN) design and training. Implemented neuroevolutionary algorithm uses adaptive genetic operators and automatic population sizing (Yu.R. Tsoy, V.G. Spitsyn, Optical memory and neural network, **13**, 225-232, 2004). The locally adaptive approach for image processing is used. For colour image processing we computed the significance of pixel brightness and then conducted the processing of obtained monochrome image. The changing of pixel brightness depends on the average significance and dispersion of brightness in the neighbourhood of pixel, and value of average brightness of initial image. The appropriate ANN has 3 inputs and 1 output. The estimated value of processed images quality is produced with taking into account the quantum of pixels on the borders between the areas with different significances of brightness and the quantum of gradation brightness levels. The reconstruction of colour information is contained in the conservation of relationship between the colour components of every pixel on the initial image.

In Fig. 1 is a show the initial images and Fig. 2 is presents the appropriate image after NEvA processing. On the base of comparison this images we can do the conclusion about appreciable enhancement of images after NEvA processing. The number of connections between neurons is equal to 8 and the number of hidden neurons is equal to 2. It is significant that the trained ANN may be obtain to image processing for images, which not include in the learning set. The average time of computation for one image is equal to 1 second on the Pentium IV processor, that much less than in case of application for image processing only genetic algorithm (C. Munteanu, A. Rosa, IEEE Trans. on Systems, Man, and Cybern. – Part B: Cybern., **34**, 1292-1298, 2004).

Thus here has been considered a new method of monochrome and colour image enhancement on the base of evolutionary computations and neural network technologies synthesis. The results of suggested method exploration are shown its adaptability for rapidly image enhancement. Further development of the proposed method is planned considering its use for the problems of mines detection, recognition of moving objects, cracks detection and medical images enhancement.

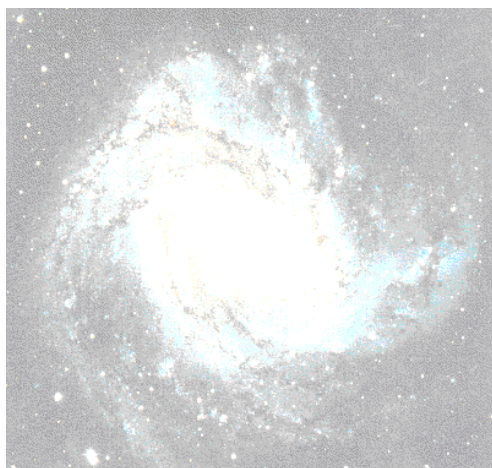


Figure 1: Original image of galaxy



Figure 2: Output image after NEvA processing