THE DEVELOPMENT of TOPOLOGICAL ALGORITHMS of IMAGES RESTORATION

Alexandr Ginkul, Natalia Emciuk, Victor Jileaev, Igor Mardare.

Technical University of Moldova,
MD-2012, R. Moldova, Kishinau, St. cel Mare, 168
mardarei@mail.md.

Abstract **- This paper deals with the problem of pattern recognition; view in particular, restoration of an initial kind of object on base of it discretized to the image. The problem of development of topological restoration algorithms is solved.**

Key words **- discretization, restoration of images, pixel, topological restoration algorithms.**

I. Introduction

The process of restoration of image consists in increasing of quantity of the information about form and structure of object. The restoration provides definition of ways of pixel transformation and rules of assignment of intensities of one of **К** to new pixels. Ways of transformation assume, that by transition from **N**-1 to **N** quantity levels discretization pixel *abcd* will be transforms in to four new pixels *a, b, c, d,* placed in square lattice nodes of dimension 2x2 by fifteen possible ways [1].

II. Rules of assignment to pixels new values of intensity

The main strategy of restoration of the image is based on the way according to which, transformed from group of pixel *abcd* pixel *a* will be basic points for restoration of group of pixels *b, c, d* (fig. 1).

a	b	a	b	a	b
c	d	c	d	c	d
a	b	a	b	a	b
c	d	c	d	c	d
a	b	a	b	a	b
c	d	c	d	c	d

Fig. 1. Reception of basic points of image fragment.

According chosen way of transformation it is necessary to appoint intensity of pixel ***abcd*** pixel ***a***. By this procedure simple reduction of image occurs. Further, if it is necessary, the intensity of pixel ***a***.can be corrected in the part of increasing or reduction, as during discretization the intensity of pixel ***abcd*** could be received as minimal, average or maximal from intensity of pixels ***a, b, c, d*** [2]. Thus, pixels ***a***.are basic points (centers of crystallization), relates to which the images of object will be completed by filling pixels ***b, c, d***. It can be carried out by following rules:

- filling of all pixels ***b*** on ***a*** horizontal;
- filling of all pixels ***c*** on ***a*** vertical;
- filling of all pixels ***d*** on one of diagonals lying between pixels ***a***.

On the basis of these given rules three ways of intensity assignment to each of pixelов ***b, c, d*** are possible:

- assignment to pixel value of intensity equal to the lowest, average or the greatest of two intensity values of nearest pixels ***a***..

The combinations of these ways are possible as roll, for example, to pixels ***b*** are assigned intensity value of nearest pixels ***a*** to pixel ***c*** – the greatest one, but to pixel ***d*** – the average one, etc. From received sorting method variants of images the expert chooses the best one, in which the structure and character of image is most full reflected. The quantity of sorting variants for three ways of intensity assignment is within accessible limits.

The offered rules and ways, despite of evidence and simplicity, give quite good practical result. Especially they are good at initial stages of image restoration, when the definite actions are necessary, but it is unknown what to do. Application of more powerful algorithms, for example, based on neuron networks by training with the teacher, needs a set of output system vectors that may be not possible. The final result essentially depends on a correctness of first steps. At the chosen strategy it is guaranteed, that the initial processable image as a minimum will not be spoiled. The criterion of quality of realized approach is recognition of object.

On the basis of offered algorithms the computer program of restoration of image was developed [3]. On the working panel there are button of discretization of the image, of a choice of rules and ways of image restoration, and of return to the previous image used in a case of a unsuccessful choice of a rule or a way.
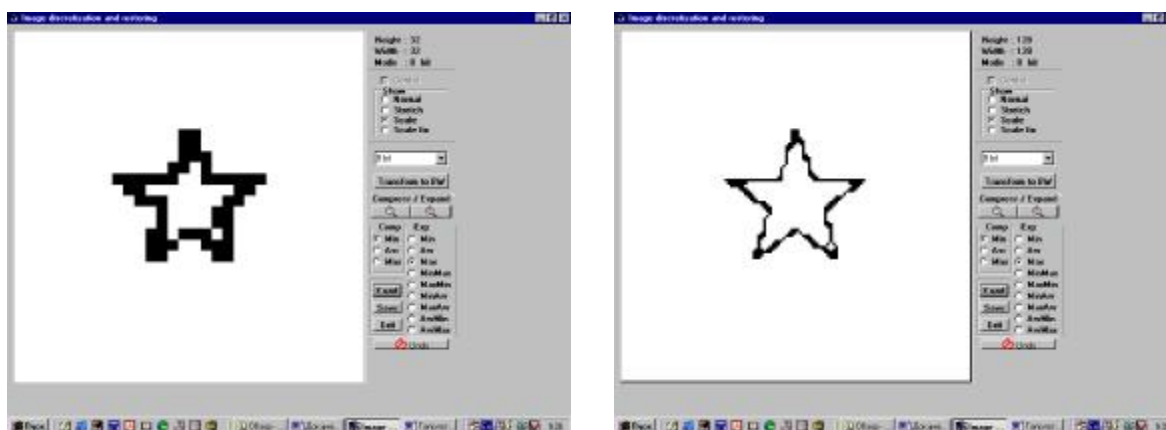
Fig. 2. The initial and restored image of object.

III. Conclusion

The carried out experiments have shown, that structured images of objects are restored quite well, and even in case of some differences from an initial image of object can be identified that by approximation. Such differences in many cases are quite admitted. For real objects and stages, the images in many cases are well guessed, however it is first of all the merit of the experts. In cases, when the essential detailization image is necessary, more powerful methods of restoration of the image are required, for example, systems of artificial intelligence.

Bibliography

1.А.Гинкул, В.Жиляев, И.Мардаре Пространственная дискретизация и восстановление изображения, Acta Academia 2001, Chişinău, 2001, стр. 189-192.

2.И.Мардаре, И.Корня, Применение порождающих грамматик для пространственной дискретизации изображений, Acta Academia 2000, Chişinău, 2000, стр. 236 – 238.

3.V.Jileaev, I.Mardare The restoration of the digital images. Chişinău: 1ˢᵗ Internaţional Conference "Informational technologies - 2001" Bit+, 11-13 apr.2001.