

## ENERGY SPECTRAL CHARACTER RECOGNITION SOFTWARE

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### I. Formulation of the problem

Character image recognition has considerable scientific and practical application, in particular, the recognition of printed character images.

A number of methods are used to solve this problem, namely template, structural and characteristic methods [1]. However, most existing methods provide high recognition accuracy only if the characters are not significantly different in scale, offset, rotation angle and font. Therefore, the development of software for image recognition with energy spectra is extremely actual problem.

### II. The purpose of the work

The purpose of the work is software implementation, research and optimization the method of recognizing symbol images by radially distributing their energy spectra.

### III. Encoding individuals in algorithm synthesis ternary return combinational schemas

Based on the analysis of algorithms and methods for processing digital images, an algorithm for the program "p1\_Recogn", designed to recognize the characters of images, was developed.

As a result of comparing radial distributions of energy the spectra of the unknown image and the standard is selected as follows a standard whose spectrum is most similar to that of the unknown image [2].

The program also allows you to zoom in on a loop the original image in the specified range and choose one the scale at which the spectrum of the sample image best matches the spectrum of the standard. Developed in MATLAB and using the .NET modules, the program is designed to record radial energy spectrum distributions for image standards in a file.

That is with the help of the developed software complex the user first forms spectra of image standards and writes them to a file, and then performs image recognition on the basis of the spectra.

After conducting scientific research, it was concluded that it is necessary to study this method of image recognition, since the energy spectrum is not sensitive to image shifts. When scaling images, the high-frequency part of the spectrum distribution changes, so only the low-frequency part of the distribution (25%) is taken into account when comparing the distributions.

Testing of "p1\_Recogn" program for recognition character images, based on both offset and scalable images. An example is shown on figure 1.

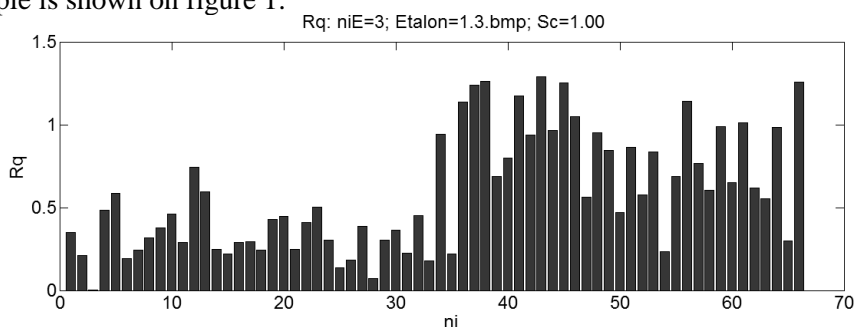


Figure 1- The recognition of the shifted image of the symbol«B».

The mean square error Rq between PRL and PRLE for reference images with ni numbers.

### Conclusion

As a result of scientific research performed software implementations for the formation of energy spectra and character recognition in MATLAB and using C# .NET in Visual Studio environment.

### References

1. Image Processing Toolbox. [Electronic resource]. - Access: <http://matlab.exponenta.ru/imageprocess/book2/22.php>.
2. Gonzalez R.C. Digital Image Processing Using MATLAB / R. C. Gonzalez, R. E. Woods, S. L. Eddins. – Pearson Prentice-Hall, 2015.– 612 p.