

# Image reconstruction by gradually increasing the number of principal components

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## Abstract

Recently, breakthrough works have appeared devoted to the reconstruction of images based on methods and algorithms for image restoration. Such methods and algorithms are orders of magnitude superior to classical refractive analogues, significantly inferior in the quality of the resulting images due to the strong optical distortions inherent in diffraction optics. In this work, we will show an analytical overview of image reconstruction methods that can significantly improve the quality of the resulting images during reconstruction (restoration). An effective method of image analysis is the method of principal components and neural networks. The proposed reconstruction process consists of a preliminary stage of colour correction of the image and elimination of chromatic blur based on reverse convolution and convolutional neural networks.

*Keywords:* the reconstruction of images, algorithms, reconstruction methods, neural networks.

## 1 Introduction

At present, biometric technologies are actively developing, aimed at obtaining and using human biometric data in order to identify him.

A system using such technologies can be applied in various fields: passport control systems at airports and other large transport hubs, electronic commerce systems, surveillance systems to reduce terrorist threats and search for people [1, 2].

The relevance of the research is to investigate the tasks for image restoration by gradually increasing the number of main components. And the use of neural networks is promising for this task.

Effective methods of image analysis are the method of principal components and neural networks. The method of principal components is one of the powerful and universal means of analysis, which, without discarding specific features, allows you to take into account only the most significant combinations of their values. When using the method in the problem of image recognition, each image is decomposed into a linear combination of eigenvectors, which are called the main components. In this case, the main components can be represented as images. For example, if images represent faces, the principal component method is often referred to as the eigenface method (Figure 1) [3].

Thus, the image analysis of the principal component method can be performed as follows: for example, we have

a set of images, where each of which we will describe as  $x_i$ , and where  $i$  is the image number ( $i = 1, 2, 3, \dots, n$ ). The dimension of the vector designated as  $x_i$ . And so all images can be represented as a matrix  $X$ .



Figure 1 Photo reconstruction (eigenface)

## 2 Overview

In this paper, we conduct an analytical review of one of the image reconstruction methods:

- The method of the number of principal components.
- Image analysis by the method of principal components.

## 3 Conclusion

In conclusion, doing an analytic overview of the methods and the image reconstruction algorithm, we must find the best method individually according to the problem. And in the reconstruction of images, the method of Principal Components is the most effective. To confirm the practical significance of the proposed experiments, experimental studies will be conducted on various bases.

## References

- [1] Kukharev G A 2001 *Biometric systems: Methods and means of recording a person's personality* St. Petersburg: Polytechnic 240 s
- [2] Zhao W, Chellappa R, Rosenfeld A, Phillips P J 2001 *Face recognition: a literature survey* National Institute of Standards and

Technology, Technical Report #7478 USA

- [3] *CUFS dataset* **E-source:** <http://mmlab.ie.cuhk.edu.hk/archive/facesketch.html> (date: 25.04.2015)