machine learning, which started as a scientific pursuit to search for artificial intelligence, and neural networks, which were only a learning hypothesis, have become so widespread, that they can not but affect people's lives. All these methods of automating routine, heavy or massive work help to optimize and increase the efficiency of people's work in various areas of life.

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THE ROLE OF SUPER-RESOLUTION ABILITY IN THE SPHERE OF INFORMATION TECHNOLOGIES

Super resolution is an image processing technology that allows you to increase the resolution of an image, restoring lost details. Super resolution refers to the process of producing a high spatial resolution image from one or more low resolution images. High-resolution images provide more detailed information to enable more accurate image analysis. Many fields require high resolution imaging, such as medical or satellite sensing, telescope imaging, pattern recognition, video surveillance, etc.

The super resolution method includes three main tasks: upsampling the image, increasing the maximum spatial frequency, and eliminating defects that occur during image capture, such as blur and noise. In essence, through the resolution process, you can get closer to reproducing the missing high frequency components and minimize aliasing, blurring, and noise. Over the course of the study of super resolution, many different methods have been proposed to obtain a high resolution image. Some methods use statistical models and some use deep neural networks. Methods differ greatly in accordance with the choice of dimension (spatial, spectral, or even both).

The two main steps in super-resolution are registration and reconstruction. Accurate registration is essential for excellent reconstruction results. Phase-based image matching is used to evaluate pixel translation during the registration step. While high-resolution image reconstruction processing the Papoulis-Gerchberg algorithm is used most often, which is one of the best-known super-resolution methods.

The Papoulis-Gerchberg method is an algorithm used to reconstruct an object or image from its diffraction pattern. It was developed in 1970 by Gerchberg and Papoulis. This method has found extensive application in the field of optics and wave optics. The main idea of the Papoulis-Gerchberg method is that restoration of an object or image can be achieved by alternatively minimizing errors in spatial and frequency features. First, the diffraction pattern of the object or image is measured. An initial approximation of the object or image is generated randomly then. This initial approximation is used to create a diffraction image, which in turn is used to create a new approximation of the object or image in the spatial domain. This process continues until matches are reached between the original diffraction pattern and the calculated diffraction pattern. The Papoulis-Gerchberg method has its limitations and cannot give accurate results if the original diffraction pattern has a high level of noise or if the object or image has a complex structure.

However, it is still a useful tool for object and image reconstruction in optical systems where diffraction image measurement is the only available method for obtaining object information.

When using super resolution methods, there are three points to pay attention to: image registration is extremely important for successful super resolution, if low resolution images have redundant data, then super resolution does not work very well. If low resolution images contain all information about high resolution images, that is, there is no extra data among them, then super-resolution works perfectly.

It can be concluded that superresolution can be widely used in many spheres of human activity. One of the main advantages of super-resolution is that it allows you to increase the resolution of an image without significant loss in quality, which usually occurs with the standard image upscaling method. However, it should be noted that super-resolution can be a cumbersome process that requires a lot of resources. Such a process can take a long period of time and require a lot of computing power.

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METHODS OF MODELING CONTACT OF ELASTIC BODIES

The calculation of strength and reliability of various critical elements of structures and functional equipment assemblies is a mandatory stage of design. Many of these elements have pronounced contact within a certain surface. Data on the stress-strain state of such elements and assemblies can be obtained using modern mathematical modeling techniques. Only for a relatively small number of contact problems, analytical solutions have been obtained based on the theory of elasticity. Therefore, numerical methods are the most promising way to study the contact interaction of bodies. Many scientists and researchers have worked on the modeling of the contact of elastic bodies. There are some of the most notable scientists in this field:

- Gerard A. Maugin, who investigated the contact of elastic bodies and developed the concept of elastic rods;