Development of Image Processing Based on Deep Learning Algorithm

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***Abstract*—With the rapid development of computer technology and information technology, the development of deep learning has been greatly promoted, and as the mainstream trend of the development of deep learning, there is a great technological breakthrough in the field of image processing. This paper mainly focuses on the development of image processing technology supported by deep learning algorithm, using particle swarm algorithms, image matching algorithms and deletion strategies to optimize image processing technology, and it is found that each of these methods plays a role in pattern recognition, obtaining deeper meaning of images and deleting unimportant information. Deep learning algorithm enable the processing of a large amount of stored information and ensure the integrity of the image in the process of optimizing image processing.**

Keywords—image processing, Deep learning algorithm, Particle swarm optimization introduction, Image matching algorithm, Pruning strategy

I. INTRODUCTION

Our life is inseparable from image, and images are one of the forms of information we have the most contact with. At present, image processing has been in the era of intelligence, especially deep learning algorithm has achieved remarkable results in the field of image processing. Traditional image processing technology still has some problems. Based on big data processing technology, deep learning algorithm can optimize image processing technology.

At present, the research on image denoising, classification and image enhancement is mainly focused at home and abroad, and there is less research on optimizing the process and saving network resources in image processing.

This paper mainly focuses on the development of image processing technology supported by deep learning algorithm, and optimizes image processing technology by using particle swarm optimization algorithm, image matching algorithm and deletion strategy. It shows that deep learning deep learning saves some network resources while ensuring the integrity of images. This paper has problems without studying the specific application of image processing in practice.

II. DIGITAL IMAGE PROCESSING TECHNOLOGY AND DEEP LEARNING ALGORITHM

Image processing is a modern technology that converts image information into digital information, so that it can be better recognized and processed by computer. Image processing can be roughly divided into a series of processes such as image classification, compression, enhancement, coding and feature extraction. In order to ensure that the image is clear enough and effectively identify information, image processing should be supported by various technologies to improve the resolution and quality of the image. The development of artificial intelligence technology also promotes the development of image processing technology, which makes image processing technology widely used in areas such as pattern recognition, machine vision, and multimedia technology [1]. The specific application fields can be roughly summarized in Table I.

TABLE I APPLICATION FIELDS OF DIGITAL IMAGE PROCESSING

subject	application
Physics, chemistry	Spectrum analysis, Pressure analysis, Gene characteristic analysis [2]
Agriculture	Crop yield estimation [3], Natural disaster detection
Ocean	Fish exploration, Marine pollution detection, Ocean wave observation
Communication transportation	Multimedia communication, LCD characteristic analysis Tunnel monitoring [4], Railway line selection
Industry	Crystal oscillator component defect detection [5]
Military	Military reconnaissance, Missile guidance, Military training

With the application of deep learning (DL) algorithm to all walks of life, deep learning is increasingly used in the field of images, such as medical diagnosis and motion recognition [6], and the most typical application is face recognition. However, due to the limitations and subjectivity of traditional image recognition algorithms, many studies can not meet the application requirements, so deep learning will soon be applied to all links of image recognition and processing. At present, the applications of deep learning in image field include image recognition and image forensics. As shown in Table II below.

TABLE II APPLICATION OF DEEP LEARNING IN IMAGE PROCESSING

field	application
image recognition	Local modification of network structure, Image enhancement
image forensics	Simple migration, Network input, Adaptive forensics structure

III. IMAGE PROCESSING TECHNOLOGY BASED ON DEEP LEARNING

Traditional image processing technology has some problems in image segmentation, and generally tend to ignore the deeper meaning of the image in feature extraction

or cannot effectively remove the unimportant information, while the image processing optimization techniques based on deep learning algorithm of big data processing technology can solve the problem well.

A. Image Processing Optimization Technology Based On Particle Swarm Optimization

This method is widely used in pattern recognition and image processing technology, enabling image segmentation, calibration, fusion, compression, and synthesis with significant and efficient results. Image segmentation and processing is a key step in image processing technology and a basic technology for processing complex images. It segments the target and background, and considers the hue information and region information of pixels, making the segmentation process more efficient and accurate. Particle swarm optimization algorithm solves the disadvantage of long time-consuming image processing and segmentation. In addition, the image acquisition process leads to blurred images due to the influence of external environmental factors such as the atmosphere, resulting in image information that cannot be further analyzed and understood, then blurred image recovery becomes one of the difficult areas of image processing [7]. Particle swarm optimization algorithm can solve the problem of image blur and clear restoration caused by defocus blur and motion blur in the process of image acquisition, solve the problem of image degradation, and make the image closer to the real scene. Compared with the application of other algorithms, this algorithm requires simple input variables, easy to operate, and the most importantly, efficient, and has application cases in many fields, based on its ability to simplify complex and large number of image processing applications with ease, and can be used in conjunction with other algorithms, and is a very compatible algorithm in image processing optimization techniques.

B. Image Processing Optimization Technology Based On Image Matching Algorithm

There are many commonly used image matching algorithms, and their principles and methods are basically the same, mainly by comparing the information and grayscale features of images to achieve image retrieval. The efficiency of image processing using image matching algorithms to solve the optimal solution is mainly based on image features, search rules, regions and other factors, and image search technology is the basic condition [8]. Among them, the theoretical support for image matching is provided by the particle swarm optimization algorithm and the scale invariant feature transform (SIFT) algorithm, which is an evolutionary computational technique whose main role is to implement the search function. Image processing and feature extraction based on SIFT algorithm can reduce the probability of matching failure and realize the optimal image matching. The SIFT algorithm is extremely fast and can extract feature vectors and determine fixed values of position features and size features as filtering feature information when processing images to achieve high anti-interference capability and high efficiency. Image matching algorithms are divided into three types: grayscale, feature, and relational. Among them, feature matching in based on the principle of feature extraction extracts the features of the image through preliminary processing and uses particle swarm optimization algorithm for matching to accurately identify grayscale, shape changes and occlusions on the basis of excluding external interference factors to achieve the image matching task and make the matching reach the optimal solution. In the process of image matching, the feature extraction method based on grayscale, feature and relationship description is more prominent, and the efficiency can be improved by combining image matching algorithms to eliminate non-optimal solutions through intelligent recognition and continuous correction of variables, and finally complete image matching optimal solutions quickly in the region.

Image matching algorithm is a key component of image processing technology. In the image processing optimization technology, SIFT algorithm has good robustness to noise, viewing angle change and illumination change [9]. Using this algorithm, we can highlight the viewing angle, grayscale level and optimization features without changing the image features.

C. Image Processing Optimization Technology Based On Pruning Strategy

Artificial neural network is widely used in image processing, speech recognition and other fields. It contains hundreds, thousands or even millions of processing units called "artificial neurons" (just like neurons in the human brain). Artificial neurons work together to solve specific problems. The basic neural network consists of three layers: an input layer, a hidden layer, and an output layer. The hidden layer can be further divided into convolutional, pooling, batch normalization layer, activation layer and fully connected layer according to different neural networks.

In the connection of convolutional neural network, some layers are more important, while others are not used. Therefore, some unimportant convolution cores are removed while the more important convolution cores are retained, which can make the operator easier to calculate, while reducing some unnecessary redundant computations and saving network memory and processor computational resources, thus achieving network optimization of convolutional neural networks [10]. The main culling strategies in image processing are weight-based culling, relevance-based culling, and convolutional kernel-based culling. In addition, the deletion of convolution kernel can be fine tuned. When the culling rate is relatively large, the definition of the processed image will be reduced. At this time, it is necessary to compensate the lost pixels of the image through some technical means, so as to make the image closer to the original image without distortion [11]. Fine tuning operation is to learn, train and update the model after the convolution kernel deletion operation, so as to compensate for the over deletion problem caused by the deletion operation. Specifically, the fine-tuning operation uses the gradient descent algorithm to train and learn the neural network through a relatively small momentum. Finally, the performance of each layer of the neural network is improved, so as to improve the accuracy of image recognition.

IV. CONCLUSION

With the support of big data processing technology, deep learning algorithms based on deep learning can realize the processing of large amount of stored information. Traditional image processing techniques in feature extraction generally tend to ignore the deeper meaning of the image or cannot effectively remove unimportant information, while deep learning algorithms based on big data processing technology

can effectively touch the deeper meaning of the image and remove unimportant information, which ensures the integrity of the image and saves network resources at the same time.

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