Universe
Scientific Publishing

Application of Antagonism Neural Network in Data Processing of Graph Calculation

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Abstract: with the development of science and technology, especially information technology, image processing technology has become an indispensable and powerful tool in scientific research. Traditional image processing methods cannot meet the needs. Researchers began to explore new and more effective methods. Among them, neural network image processing is the most active direction. Compared with traditional algorithms, neural network algorithm has the advantages of strong parallel computing ability, strong nonlinear imaging ability and strong adaptability. With the in-depth study of neural network theory, people have fully realized the advantages of neural network technology in parallel computing ability, nonlinear mapping and adaptability. Different neural network models are widely used in the field of image processing. Neural network technology has also become a hot research topic.

Key words*:* Neural Network; Figure Calculation Method; Data Processing

Introduction

Neural network technology refers to artificial neural network (ANN), a new intelligent information processing system constructed by simulating the principle of biological neural system, referred to as neural network for short. Since the introduction of the concept of artificial neural network in the 1940s, artificial neural network has been applied in many fields and has a good performance in anatomy, physiology and sociology. With the gradual development of artificial neural network technology, it is also used in clinical medicine, such as disease prediction, prescription compatibility, medical image processing and so on. The application of neural network provides a new platform and direction for the research and development of clinical medicine.

1. Definition and principle of neural network

Neural network uses the mechanism of biological neural network, that is, it simulates the intelligent information processing process of human brain through the complex and flexible connection between a large number of relatively simple nonlinear neurons. Neural network does not really reflect the function of the brain, but abstracts, simplifies and simulates the biological neural network. A complex information processing system is composed of various simple processing units (neurons), which are connected in parallel and are usually very nonlinear. This system can be trained, that is, it can improve its performance through the accumulation of experience. At the same time, because of the high parallelism, they can make decisions quickly and have fault tolerance. Different neural networks constructed by neurons are used to simulate biological neural networks to process different information. At present, neural network has been applied in the fields of image processing technology, speech recognition, character recognition, pattern recognition and classification, signal processing, process control and optimization. Digital image processing is the newest and most important application field of neural network. Although the research on biological neural network is very limited due to limited resources, the application of this neural network model has achieved great success. For example, the commonly used traditional neural networks are BP, Hopfield, etc. There is also PCNN pulse coupled neural network, which has been studied since the 1990s.

1.1 BP network

BP neural network is a multilayer feedforward network using error feedback algorithm. A typical BP network is a layered three-layer feedforward network, namely, the input layer, the hidden layer (also known as the middle layer) and the output layer. The neurons in the adjacent layers are completely interconnected, and there is no connection between the neurons in each layer. It learns in the way that teachers teach. With the change and repetition of "mode forward propagation" and "error back propagation". The actual output of the network is gradually close to the corresponding expected output, and the response accuracy of the network to the input mode is also improved. Through this learning process, after determining the connection weight between layers, the image can be processed accordingly.

Because BP network and error feedback algorithm have middle hidden layer and corresponding learning rules, they can approximate any nonlinear mapping relationship and have good generalization ability. In particular, its learning algorithm has clear mathematical chapters and clear steps, and has broad application prospects. BP network can well deal with the image approximation problems hidden in a large amount of data, especially the real-time problems that can be adaptive through learning, such as image segmentation, pattern recognition, adaptive fuzzy control and so on. In the field of image processing, it is widely used as a non-adaptive neural network technology. However, BP network is not perfect. It has the following main defects: the learning convergence speed is too slow, the learning and storage of the network are unstable, and it is easy to fall into local minima.

1.2 Hopfield network

Hopfield network was proposed by johnhopfield in 1982. This is a dynamic network with self-feedback. Each unit can have only two outputs. 1 (for inhibition) or +1 (for stimulation). However, each cell has multiple inputs, and each connection has a certain strength. The equipment summarizes the impact of all connections at any time. By multiplying the current input signal (-1 or +1) by the corresponding weight, the influence of each input on the unit can be obtained. If the sum is greater than 0, the initial state is set to +1 (on average, if the cell excitation input is greater than the inhibition input, the output is positive), otherwise the output is - 1. This means that because the input of other cells changes, the output of cells will change. Therefore, the calculation must be repeated until the output of all cells is stable. The status of all units will not change at the same time, but will be executed separately in random order. Hopfield proved theoretically that given a certain number of weights (connection strength) and any input, the network will not roam indefinitely and will still vibrate, but will soon reach a static state.

In Hopfield network, the so-called "lifting rule" is used to adjust the connection weight between neurons, that is, if two cells have the same output, the connection weight between them is set to +1. If they have opposite outputs, both weights are set to - 1. Roughly speaking, each unit will motivate its "friends" and try to weaken its "enemies".

Hoplieb neural network is mainly used for associative memory and optimization calculation. If we can transform the problem into Hopfield calculation energy function, and make the minimum extremum of the calculation energy function accurately match the solution of the problem under certain conditions, then we can use Hopfield network to solve the problem. Hopficld network is widely used in image processing, such as image edge detection, image pattern matching and recognition.

1.3 Pulse coupled neural network PCNN model

Since the 1990s, eckhorn et al. Have studied the synchronous oscillation of the neural pulse sequence in the cat visual cortex, obtained the mammalian neuron model, and developed the pulse coupled neural network pcnv model. The model has the characteristics of grouping pixels with similar two-dimensional space and gray scale of the image, which can reduce the local fatigue difference of the image and compensate the local small discontinuity of the image. This is an incomparable feature of other image segmentation methods. PCNN is mainly used for feature extraction, edge information analysis, image segmentation and target recognition. Its application research is gradually expanding. At present, the large format image diagnosis system based on PN is developing military target recognition system, image segmentation and target classification system.

2. Neural network image calculation and processing method

Digital image processing, also known as computer image processing, refers to the process of converting image signals into digital signals and using computers for processing. Digital image processing first appeared in the 1950s, when computers had developed to a certain level. People began to use computers to process graphics and image information. As a subject, digital image processing appeared in the early 1960s. The purpose of early image processing is to improve image quality. It aims to improve image quality. Human and improve human visual effects. In image processing, the quality of input image is low, and the quality of output image is high. Common image processing methods include image enhancement, restoration, coding, compression and so on. Since the mid-1970s, with the rapid development of computer technology, artificial intelligence and thinking science, digital image processing has developed to a higher and deeper level. Many countries, especially developed countries, have invested more human and material resources in this field and have made many important research results.

2.1 Image compression

The application of artificial neural network in image compression has achieved good results. For the most important coding methods such as predictive coding, transform coding and vector quantization, the use of artificial neural network has great advantages over the sequence calculation method, mainly in the following aspects:

(1) Because the weights of the network are generated by training, it can adapt to the changes of input data through training in the process of processing new data.

(2) Since the data is trained separately, there is no need to over store all training sets, which is particularly important when processing large amounts of data, such as images.

(3) Due to the high connectivity of artificial neural networks, neural networks can be self-organized.

(4) The similarity between neural network and neurobiological system makes artificial neural network more similar to the processing method of human visual information.

2.2 Image segmentation

The idea of image segmentation using neural network method is to use the training sample set to train the neural network, determine the connection and weight between nodes, and then use the trained neural network to segment the new image data. This method needs a lot of training data. Neural network has a large number of connections, so it is easy to introduce spatial information. It can solve the problems of noise and nonuniformity in images. The choice of network structure is the main problem to be solved by this method.

Based on relaxation labeling and artificial neural network theory, a neural network image segmentation method under low signal-to-noise ratio is proposed. Mr. Liang's neural network is a master-slave network. From the network to the Kohonen network group. After the first image segmentation, he uses the results to initialize the state of neurons in the main network. From this initial state, the main network develops dynamically until it converges to the attractor of the main network, so that the state of the main network can obtain the image segmentation results.

Blanz and Gish used a three-layer feedforward network for image segmentation. The number of nodes in the network input layer corresponds to the characteristic number of pixels, while the number of nodes in the output layer corresponds to the classification number. Babaguchi et al. Used multi-layer BP network to expand the image and segment the image, and achieved certain results. In babaguchi's BP network, the input is the histogram of the image, and the output is the required threshold. This method must use many images with known thresholds as examples to train the network, but it is difficult to obtain many samples in practical applications.

Ghosh proposed a method of target extraction in noisy environment based on neural network. The image region is regarded as a Gibbs random field polluted by Gaussian noise, and the segmentation result is obtained by calculating the maximum a posteriori probability. Because the Gibb random field model considers the interaction between adjacent pixels, this image segmentation method based on neural network actually considers the texture information of the image.

2.3 Image enhancement

The main purpose of image enhancement is to achieve a certain effect after image processing. Different images have different processing methods, which makes it difficult to find standard formulas or functions. Therefore, we can use the learning characteristics and self-organization ability of neural network to complete this task. In addition, neural network can also be used in image restoration, target recognition, pose matching in computer vision and other fields. The introduction of neural network has greatly enriched the means of image processing.

Concluding remarks

In view of the powerful function of neural network and its strong advantages in processing and solving problems, we believe that it will play an increasingly important role in the field of image processing. Neural network has many applications in image processing, such as image compression, image segmentation, edge recognition, image enhancement, image recognition and so on. Neural network has the ability of self-organization, non-linearity and self-learning, and plays an important role in many fields. It is speculated that with the development of the theory and practice of artificial neural network, it will play a greater role in the field of image processing in the near future.

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