

## Intelligent Recognition Technology using Artificial Neural Network for Graphics

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**Abstract** — This paper proposes an ANN fast algorithm to detect edges of objects from background in a relatively simple environment. Using the edge direction of expansion and sector expansion method, we make full use of previous information of edge features to reduce edge detection time. Then we use these features as basis for recognition, and define the concept of ‘coefficient of variation’ of the measures commonly used to detect features of edge translation, rotation and scale invariance. We use a small selection of invariant features to form a set of identifying features. Finally, a method based on improved neural networks to identify classification, using online computing time, we get rapid identification of the target classification process. Experiments show the proposed techniques meet the demands to get identification in high speed real-time.

**Keywords** -- *Intelligent Recognition; Artificial Neural Network; Graphics Recognition*

### I. INTRODUCTION

Image is human access to information, expression information and important means of information transfer. Image recognition means that the image correlation process by computer and uses mathematical algorithms to image data analysis and understanding, in order to achieve specific objectives and identify the technical object from the image. Image recognition technology is computer image processing, artificial intelligence and pattern recognition technology combined with comprehensive technology, artificial intelligence is a hot area of research [1-2]. Currently, due to the non-contact type image recognition technology for strong features, so that in the field of industry, agriculture, medicine, robotics navigation, satellite remote sensing to be more widely used [3]. Target recognition method based on image because of its low cost non-contact properties and was widely welcomed by industry, security and other fields [4]. With the application of in-depth, identifying the object type range identification systems are often designed to be very complicated in general will complicate the ability to meet the requirements of recognition, object recognition system to extend the time, which for some of the higher real-time requirements of occasions be fatal, such as industrial line detection and video surveillance. In order to solve the contradiction between recognition and real-time image recognition systems between, this article from the overall consideration of the whole process of image recognition, image recognition design an optimized system.

In order to enhance the ability to identify, classify this paper applied to the target network has been improved to increase their level of intelligence: self-organization in order to mimic the human target recognition process self-learning ability, activity concept paper will alert value adjustment mechanism introduced network, improved network in target recognition process, it is possible for different target types and different learning stages, resulting in different enthusiasm for learning; and can under the conditions of

supervised and unsupervised learning to complete the image of the target, recognition and memory [5].

In this paper, based on image recognition method, the paper constructs a picture based on artificial neural network target recognition systems, including edge detection, feature extraction, stereo matching and localization and man-machine interaction and other functional modules. Each module completes a specific function, and thus the project is beneficial to system maintenance and expansion. After the first system image target recognition, then the implementation of stereo matching, to achieve targeting capabilities. Run the test system proves that the realization of the image recognition system has a high speed and high precision, and therefore has a relatively broad application space.

### II. THE PROPOSED ARTIFICIAL NEURAL NETWORKS

Generally defined neural network expert Hecht Nielsen given artificial neural network is: neural network is composed of a plurality of very simple processing unit connected to a computer system in some way to each other to form another, the system by which the state of the external input information the dynamic response to process information [6-7]. Because the neural network has a strong nonlinear fitting capabilities, it can be mapped to any complex nonlinear relationship, and learning rules are simple, easy to implement computer. It has strong robustness, memory capacity, nonlinear mapping ability and strong self-learning ability, while the traditional linear fashion is no automatic recognition learning ability, so this use of neural networks to improve verification code identification of self-learning ability. Neural networks are used herein refers to an artificial neural network. Artificial neural networks are abstract a discipline from the signal transfer mode biology of the nervous system. In the neural network, the most basic is the neurons, neuron consists of three parts: the cell body, dendrites and axons [8]. Dendritic tree of nerve fibers is receiving network, it signals

transmitted to the cell body, the cell body of these data integration and threshold value processing. Axon is a single long fibers, which guide the cell body of the output signal to other neurons. Arrangement topology and synaptic neurons link determines the strength of neural networks. Neurons are the basic neural network processing unit, the general performance of a multi-input, single-output nonlinear model. BP (Back Propagation) network is a reverse error propagation according to the feed forward neural networks Multilayer, is one of the most widely used neural network model [9], shown in Figure 1.

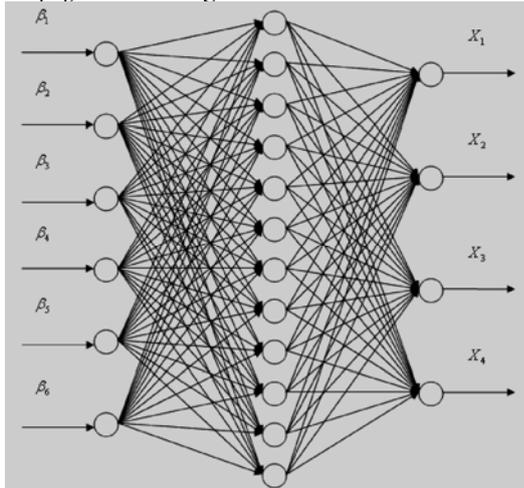


Figure 1. The structure of the BP neural network.

BP network can learn and store a lot of input - output mode mappings without prior reveal mathematical equations that describe this map. Its learning rule is to use the steepest descent method, by reverse spread to constantly adjust the network weights and thresholds, so that the smallest error square and networks. BP neural network model topology includes an input layer, the hidden layer and output layer. As used herein, a typical three-layer BP neural network to assist in identifying the verification code, to obtain an image of a single character after a pretreatment, image segmentation, image input to the neural network, neural network learning.

BP neural network is using BP algorithm for training a network, the network having an input layer, an output layer and at least one hidden (intermediate) layer. Workflow BP neural network shown in Figure 2.

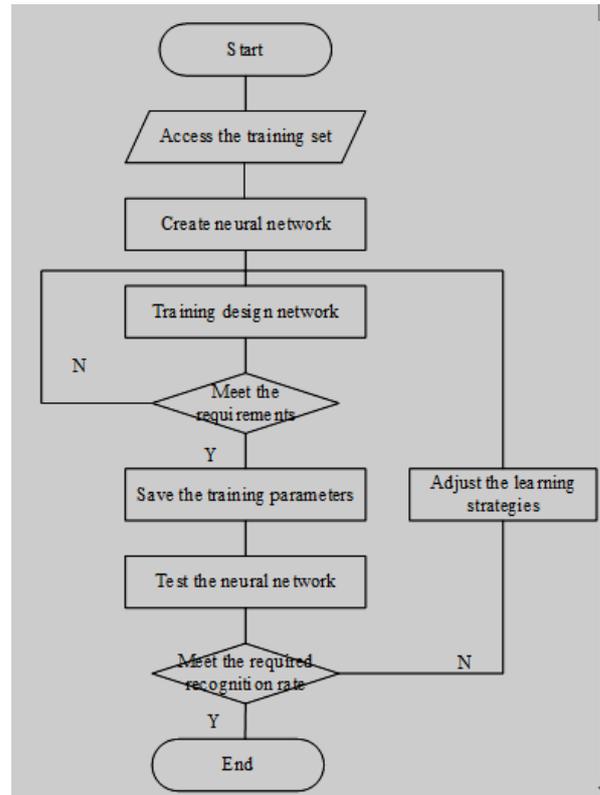


Figure 2. The BP neural network workflow.

### III. DIGITAL IMAGE REPRESENTATION

An image of the recorded information of the object is actually a function of radiation energy dynamic spatial coordinates, time and wavelength, it can be removed for still pictures, the function of the space coordinates, wavelength and time, so that an image can use a two-dimensional the function  $f(x, y)$  to represent the two-dimensional function after sampling and quantify the resulting image will be called a digital image [10-11].

Sampling: the image using a grid overlay, the average brightness of each of the take each small grid simulation image as the point of the small cells in value, so that an image becomes a small box with only the mid-point of brightness discrete values to represent the average of the image, put the image of the spatial coordinates discrete, process determines the spatial resolution of the image, the image after the sampling process is called digital image. After the smallest unit by discrete digital image is pixel, each row of pixels of an image into  $M$ , each column of pixels into  $N$ , the size of the image is  $M \times N$  pixels, a two-dimensional function  $f(x, y)$  constitutes  $M \times N$  matrix of real numbers, as shown in Equation 1.

$$f(x, y) = \begin{pmatrix} f(0,0) & f(0,1) & \dots & f(0,N-1) \\ f(1,0) & f(1,1) & \dots & f(1,N-1) \\ \vdots & \vdots & \ddots & \vdots \\ f(M-1,0) & f(M-1,1) & \dots & f(M-1,N-1) \end{pmatrix} \quad (1)$$

The size of the above matrix equation  $f(x, y)$  of each element of the discrete samples called pixels, the sampling interval will affect the quality of the image, the more details the general image sampling interval should be made smaller quantization: After sampling process, although The successive images on the discretization space, the pixel values of the sampled but still continuous quantity, which should be quantized, that is, each successive pixel values are converted from analog to discrete processes, the image gradation resolution depends on this process. Each pixel value quantized image with a byte, the black - gray - white quantify continuous process of change from 0 to 255 total 256 gray scale values indicating the brightness changes from dark to light. Image sampling, each row, each column of pixels in each sampling point quantization levels will not only affect the quality of the image, but also affect the amount of data storage space it occupied.

An analog image by sampling and quantization process after the formation of a digital camera image is generally stored in a computer in two ways and a variety of digital storage devices.

Vector storage mode vector processing (vector) is stored. This storage in the memory when the digital image is not recorded at each point of the data, but only store the outline portion of the pixel information of the image content.

Bitmap storage. In this way the stored image, also known as raster images. It is recorded in the memory image of the color attribute and location attribute information for each pixel in the image, the advantage of this is stored in the storage space there is enough premise, can truly reflect the hierarchical image delicate, color; drawback is With the resolution and increase the number of colors, the space will be occupied by a sharp increase, but also greatly increases the amount of calculation processing.

Digital images feature refers to an image contained in a typical characteristic as discrimination based information distribution characteristic color of objects in an image, geometrical parameter data and texture characteristics are currently the most widely used identification characteristic information, some features we can directly use visual to feel, and some feature is manifested not so direct, we need some means after transformation with a certain amount of results statements.

#### IV. GRAPHICS INTELLIGENT RECOGNITION BASED ON NEURAL NETWORKS

Image preprocessing. When the image is processed, not only in front of about a particular problem ever be able to completely Coding character image to be processed, the image processing approach is usually needed to make use of a combination of both, as shown in figure 3. For example, when the value of the image feature extraction, feature

extraction can be carried out in accordance with the way in figure 3. When the image processing in accordance with the drawing process, since the process is not included in the noise cancellation link, then it applies only to the image quality is very good case, and from the front tell, we know that because the cigarette factory work environment , and a light source when the image input device is different when information collection, clean images almost non-existent, are more or less have the presence of noise, then this process should be added to the noise-canceling part, in addition, it should increase the ash the process of transformation, which can make image processing to improve the efficiency of marking each step in the figure through the appropriate algorithm to achieve, it is determined on a dynamic algorithm parameters must be corrected in image processing.

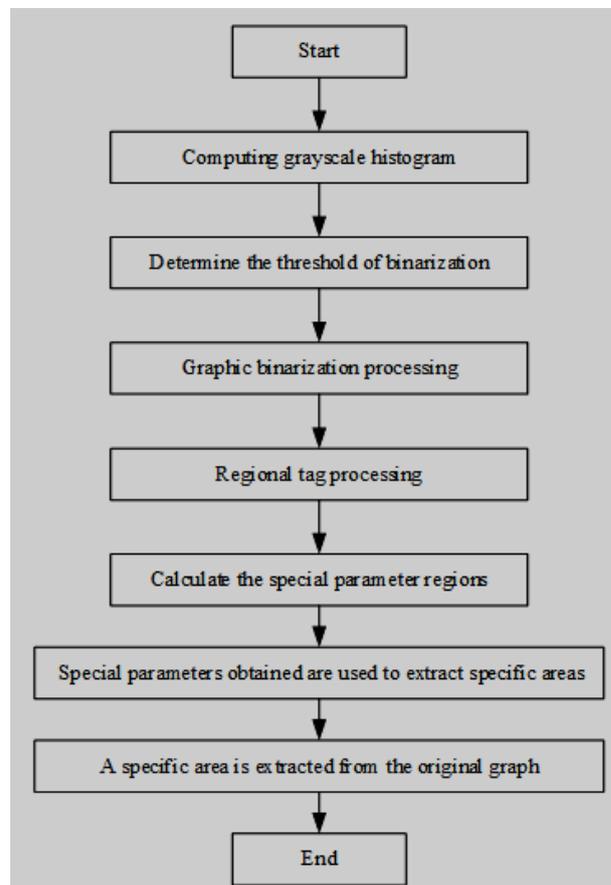


Figure 3. The image pretreatment process.

It can see the process image, using a histogram of the image description method, we can process the image on these descriptions, in algorithm design, but also by the description of the algorithm to detect reasonable. According to the results of image processing to change the image recognition system set various parameters, especially the theory of neural networks applied to image recognition, image processing algorithm will always learn the rules change. Image processing means for image recognition

system is more in the diverse, but in general accordance with the image which the chronological, we will image recognition system is divided into four parts: pre-image information acquisition, image pre-processing stage, extracting a feature value, Finally, it is extracted from the eigenvalues classification decision.

Graphics Intelligent Recognition. Neural network design priority is to get a large amount of training data set, which requires verification code image features for learning. The main input of neural network is sliced single character verification code image. In order to allow the neural network system can verify the code sample set and the training set input of learning and testing, divided into four steps.

(1) Get the training data set. Set single-character image and the corresponding correct character, and as a sample set for neural network learning, the number of samples set directly determines the recognition rate and efficiency of the neural network.

(2) Create a neural network. Initialize the neural network, neural network design layers, the number of neurons and the learning of times and error rates.

(3) Training. Using a sample set of neural network training, this process takes some time, the training process by adjusting the weights and offsets to learn, after training, the offset of each neuron to other neurons and the connection weights weight and other parameters are stored here in XML format for data storage, the purpose is to facilitate the direct use test, but not before each test training. Implement memory function neural network.

(4) Testing. The main purpose of the test is to verify the neural network training effect, by adjusting the error rate and learning strategies to improve the recognition rate, test and training is an iterative process.

Graphics Intelligent Recognition based on neural network architecture shown in figure 4.

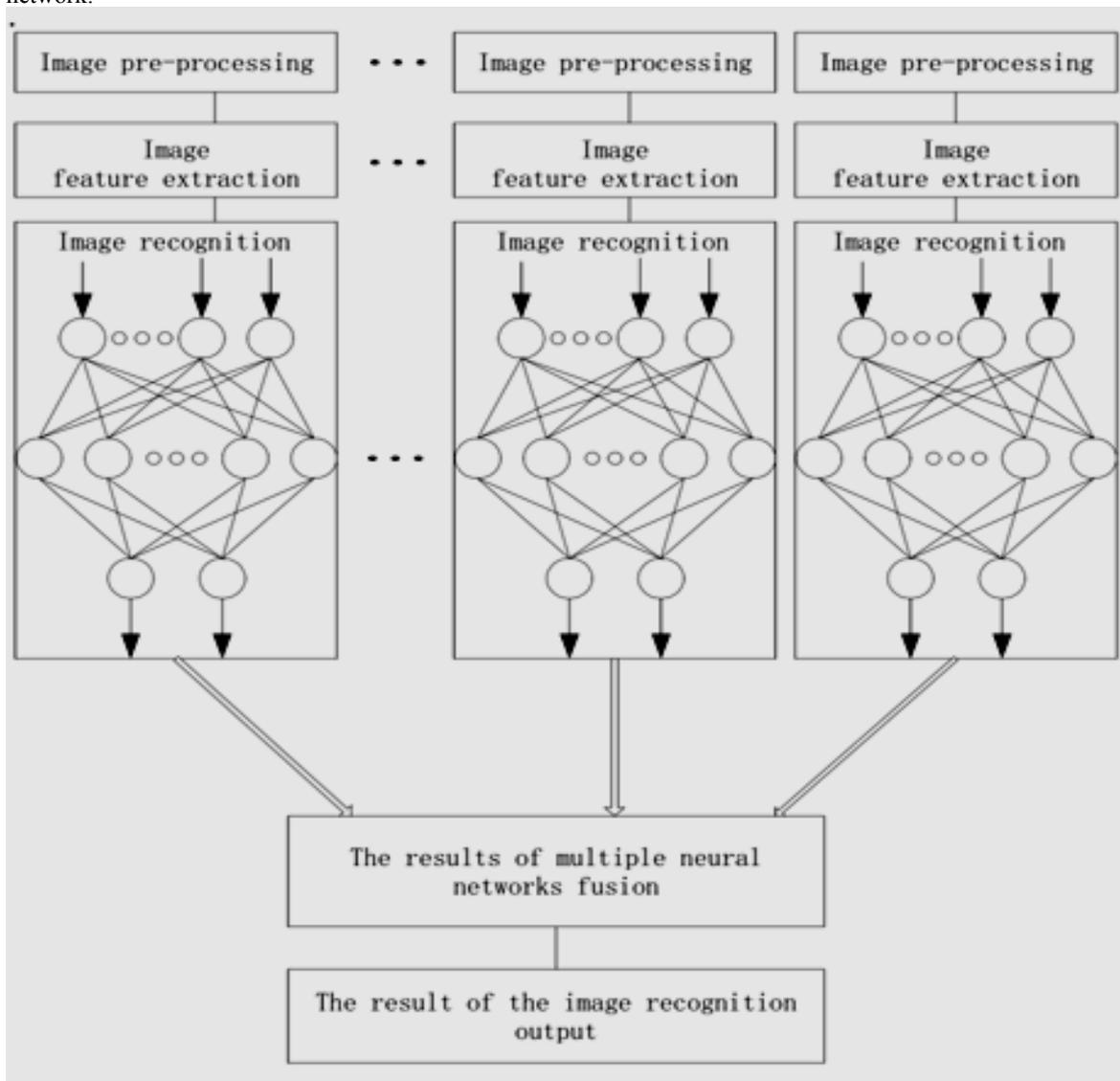


Figure 4. The system structure of image recognition method based on BP neural networks.

Among them, the image of the feature refers to an important basis for computer acquires image information for image processing, only the image of the object which contains features. If we want to extract some objects in the image by a computer, then we should inform some of the features the computer to extract the object, the computer by matching these features to find their own system models, in order to find the conditions to meet the characteristics of the object. These features include objects of all shapes and sizes to extract information such as images, these information should be able to meet the basic standard computer model library, when we give extracting features, you only need to give the object to be extracted characteristic parameters can be .

IV. Results and analysis of experiment

In order to test the performance of the image recognition method based on the multiple BP neural networks with DS theory, we select 3 breadths of images, which are shown in the Figure 5.



Figure 5. The images to be recognized.

We can get 30 breadths of images by adding a random yawp into each image The 27 breadth images of these images are selected as the training swatch; Another 3 breadth images are used as the test swatch First, we use the feature vector to train each BP networks, which is obtained by decomposing the singular value of the image matrix of training swatch. Then, we use the feature vector to test each BP networks, which is obtained by decomposing the singular value of the image matrix of testing swatch. Finally, we fuse the results of the each BP network. The results of the experiment are showed in the Table I.

TABLE I THE EXPERIMENT RESULT OF BP NETWORKS FUSION

Network	Object	The output of the BP neural network				The basic probability assignment			
		A	B	C	D	M(A)	M(B)	M(C)	M(D)
1	A	0.9064	0.0410	0.0095	0.1463	0.8216	0.0372	0.0086	0.1326
	B	0.0052	0.8041	-0.0632	-0.0910	0.0054	0.8346	0.0656	0.0944
	C	-0.1500	0.1740	1.1800	0.1654	0.0899	0.1042	0.7068	0.0091
2	A	0.9444	-0.1469	-0.0110	-0.1359	0.7627	0.1186	0.0089	0.1098
	B	-0.2786	1.0984	0.4209	-0.2095	0.1388	0.5472	0.2096	0.1044
	C	-0.0481	0.2095	0.9301	0.2932	0.0325	0.1415	0.6281	0.1979
3	A	0.9851	0.1590	-0.2767	0.0478	0.6708	0.1083	0.1884	0.0325
	B	0.1944	0.9944	-0.3890	0.1832	0.1104	0.5647	0.2209	0.1040
	C	-0.3702	0.6282	1.0819	0.3344	0.1533	0.2602	0.4480	0.1385
The fusion result	A					0.9854	0.0084	0.0054	0.0008
	B					0.0098	0.9518	0.0360	0.0024
	C					0.0441	0.0840	0.8442	0.0277

V. CONCLUSION

In this paper, real-time image recognition system conflicts and recognition between them were improved in two ways. Improvements in real-time, dynamic coefficient of variation application screening method based on feature vector selecting, retaining only the more outstanding features, so that does not affect the ability to identify the situation greatly improved real-time; then, a fast edge detection improved algorithm, algorithm can be expanded to define a fan-shaped extension of the neighborhood and the fan extending through the edge direction and a fan-shaped extension of the expansion methods, and the use of smoothing the edge of the small changes in direction of the

object properties, such that the speed of the edge detection has been greatly increase. Improving the ability to identify, the paper of the neural network has been improved, introduced the concept of activity and vigilance value adjustment mechanisms. So that the neural network is applied to image recognition, it has been greatly improved in terms of intelligence. Also, due to the use of neural network operation itself is not complicated, mostly simple mathematical calculation, etc., and therefore does not have a big impact speed image recognition system would be. Then, we designed a series of experiments to test the superiority of artificial neural network algorithm in this paper the effectiveness and image recognition systems.

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