

Figure 1 – System diagram of sample measured by free space method: *a* – transmission method; *b* – double antenna reflection method; *c* – single antenna reflection method

The free space method is a special case of transmission and reflection. Divided into transmission method and reflection method, as shown in fig. 2.

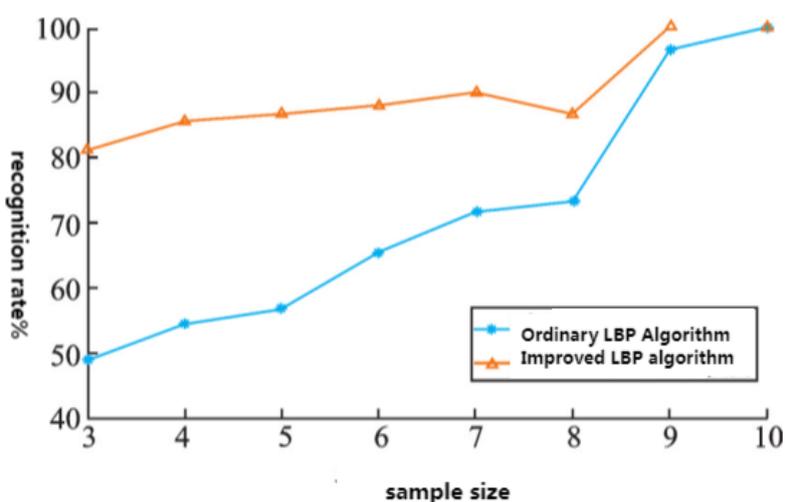


Figure 2 – Recognition rate of LBP algorithm before and after improvement of Yale face library

This article proposes an improved LBP algorithm based on the traditional LBP algorithm. After the above test analysis, the improved LBP algorithm can improve the speed of face recognition and has certain practical value.

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## **IMAGE RECOGNITION SYSTEM BASED ON CONVOLUTIONAL NEURAL NETWORK**

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**Summary.** *In recent years, image recognition technology has been widely used in civil, military, scientific research and other fields. Convolutional neural network has the advantages of automatic feature extraction, hierarchical structure, spatial*

*invariance and powerful expression ability. In this paper, we take dog and cat image recognition as an example, and construct a seven-layer convolutional network to achieve the recognition and classification of dog and cat images.*

With the continuous development of Internet technology, image recognition, as an important research direction in the field of computer vision, has rich application scenarios. Traditional image classification methods require designers to manually design feature extractors, and their performance is not very satisfactory when dealing with complex images. Through the use of convolutional neural networks, it is possible to gain a deeper understanding of image classification, feature extraction and other aspects of the technology, and apply these techniques to a wider range of practical problems such as face recognition. The cat and dog recognition problem, as a typical example of the image classification problem, has a wide range of needs in practical applications. This paper takes cat and dog image recognition as an example to complete image recognition.

As early as the beginning of the 21st century, David G. Lowe proposed the method of SIFT features + support vector machine to complete the task of dog and cat image recognition, and achieved good results. The method is to extract features by SIFT (Scale-Invariant Feature Transform) and then use support vector machine for classification [1]. However, this method is ineffective when faced with different image datasets due to limited generalisation of features. The presence of noise may negatively affect the recognition accuracy when dealing with lower quality image datasets. The need to manually adjust the parameters and design the feature extractor artificially when dealing with large scale data also results in increased time cost and wastage of human resources. These difficulties can be successfully avoided by using convolutional neural networks.

Convolutional neural network has the function of automatic extraction of image features, good noise resistance, so the data quality requirements are very low. In addition, its advantage of easy to adjust the model structure also enables it to ensure a high accuracy rate when facing complex scenes and diverse datasets. It is known in the literature [2] that some more complex convolutional neural network models, such as LeNet, VGG, etc., will complicate the problem when carrying out the binary classification task of images whose dataset is not particularly large, which will result in unnecessary resource overheads and increase the training difficulty. To avoid the above problems, this paper constructs a relatively simple CNN model (fig. 1).

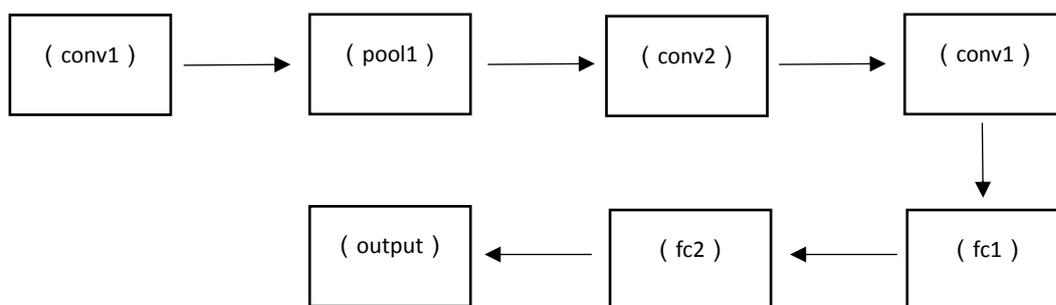


Figure 1 – Structure of convolutional neural network model

The basic idea of the procedure is to first preprocess the prepared cat and dog image data, such as image cropping. Then complete the training using the constructed CNN model as well as the cat and dog pictures in the test set. Finally, the test function is used to test the cat and dog image data in the test set and output the predicted categories and probabilities. The brief implementation process is to run the program to achieve dog and cat recognition, first read the data used for training from input\_data.py script, and then use the CNN model defined in model.py script for training in training.py script. After the training is completed, the test.py script is used to complete the test on a randomly selected image.

Based on the application of image recognition technology in today's society and life, the future development direction of image recognition technology will focus on multimodal image recognition, real-time, adaptive, interpretable and model optimisation. At the same time, in the future development of application scenarios, image recognition will also pay more attention to the development of “intelligence +”, to improve the comfort of life, the intelligence of manufacturing and so on.

### Reference

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