Data Augmentation Technology for Improving the Recognition Accuracy of Target Image

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Abstract: Relevant studies have pointed out that public has paid highly attention on the accuracy of neural network algorithm as it is widely applied in recent years. According to the present practice, it is quite difficult to collect related data when applying neural network algorithm. Besides, problems of trifles and complication exists in data image labeling process, which leads to a bad impact on the recognition accuracy of targets. In this article, analyzes are conducted on the relevant data from the perspective of data image processing with neural network algorithm as the core of this work. Besides, corresponding data augmentation technology is also put forward. Generally speaking, this technology has effectively realized the simulation under different shooting and lighting conditions by flipping, transforming and changing the pixel positions of the related original images, which contributes to the expansion of database types and promotes the robustness of detection work.

Keywords: Image Recognition; Data Augmentation Technology; Application Methods; Practical Significance

In recent years, the comprehensive level of machine learning is constantly improving in China as the continuous development of neural networks. During the training of neural network, researchers can effectively expand the original training data through the application of data augmentation methods, and realize the creation of new data sets in order to lay a solid foundation and guarantee for the improvement and optimization of neural network performance. Practically, however, researchers found that the related models often have the problem of over-fitting the samples if a small data set is used for model training, leading to undesirable test results. Regarding this problem, the researchers, after analysis, believe that this problem can be effectively solved by expanding the training and scale. Currently, the commonly used data augmentation techniques in China mainly include distorting, flipping, randomly cropping and adding noise to the input image. However, there is a relatively common problem of insufficient data in the training process. Therefore, in order to realize the image training and fur-

ther enrich its content, provide help for the effective extraction of image features, and realize the establishment of generalization model, the researchers said that it is necessary to actively explore the expansion mode to realize the reasonable expansion of data, and reduce the disk space as well as occupancy rate at the same time.

1. Overview of data augmentation methods

This article explores and analyzes data augmentation methods based on the faster-rcnn framework whose data augmentation methods mainly include four types, such as image random clipping, random scaling, left-right rotation and color disturbance.

1.1 Augmentation methods for image random clipping

Related studies show that images are likely to be blocked by other objects in the process of target image recognition, and in this case, the system usually cannot effectively obtain the complete form of the target. To effectively improve the accuracy of target image recognition, the staff should actively do relevant clipping training in the training process so as to help the system realize reasonable target recognition through fragmented data. Practice indicates that the main problem in the process of clipping training is in the large amount of objects clipped by relevant personnel, which leads to relatively few pieces of information data that can be obtained by the system, to the disadvantages of the system's reasonable discrimination of target images. To solve this problem, the researchers pointed out that the system should not be cut too much in the cutting process, and should be controlled within 1/3 of the original image volume[1].

1.2 Augmentation methods for image random scaling

Generally speaking, due to the influence of the angle when shooting the target image, it is easily leading to the change of the target image scale, and the distortion between the image and the actual situation. To solve this problem, the image can be reasonably restored by scaling the image under this system framework. For example, for the target image with unbalanced aspect ratio, the system can fix the short edge and scale the long edge to realize the guarantee of image scale, thus laying a good foundation for the image recognition effect[2].

1.3 Augmentation methods for image left and right rotation

When reading the picture, staff can flip the picture and the target frame 90 degrees to the left and right through the application of the left-right rotation data augmentation to effectively realize the data acquisition of related research objects from different angles, and provide rich data support for the development of image recognition training. Each picture has a corresponding annotation file in the system in the process, and the researchers pointed out that the function of the annotation file is to effectively record the coordinates of the target frame in the picture[3]. In general, the related coordinate points often change with the image during the rotation process, taking the upper left corner of the original image as the origin. Meanwhile, related information will be transmitted to the system to help the system better distinguish the features of different coordinate points, and provides a good guarantee for improving the accuracy of image recognition.

1.4 Augmentation methods for image color disturbance

From the perspective of colorimetry, colors of the target images may change accordingly due to the influence of environmental factors. Therefore, in the process of detection and recognition, it is necessary to change the geometry of the target, and to disturb its color at the same time to help the system further realize the analysis of the target color value under different environmental conditions. Regarding this issue, researchers should calculate the mean and standard deviation of target colors according to RGB color channels. After the calculation, researchers set the target based on the amplitude and range of color disturbance to help the system further discriminate the color of the target under different environmental conditions, and improve the accuracy of image recognition[4].

2. The effect of data augmentation method based on faster-rcnn framework

This article identifies and detects the number of related items based on faster-rcnn framework to analyze

the application effect of related data enhancement methods.

2.1 Acquisition of experimental data

Researchers obtained the related pictures through web crawlers and cameras, which served as the basic data of the experiment.

2.2 Experimental results and analysis

Relevant results indicate that the target data is often cropped into several small blocks in the application of image random cropping augmentation method, which leads to the problem of repeated detection, and is not conducive to the detection accuracy. The detection accuracy can be effectively improved by controlling the cutting method. After comparing the related results, it is found that the probability of generating smaller target frames can be effectively reduced by augmenting the image data in this way during image random scaling detection. For box-shaped objects, the system can't detect them effectively based on the original pictures. However, by rotating them left and right, the relevant data can be detected and the accuracy of the detection results have been improved[5]. During the application of color disturbance augmentation method, the results show that the system can effectively detect different kinds of fruits through the application of color disturbance, and the accuracy and efficiency of the system detection can be improved.

3. Other commonly methods for data augmentation

3.1 Distortion correction detection method

After long-term practices, researchers find that the distortion at the edge position in collected images are often caused by cameras in the process of image detection, which leads to the barrel distortion of the image[6]. To solve this problem, some researchers believe that distortion correction can be used to improve it. However, relevant data show that the image corrected by this method will have the problem of visual field defect. Besides, the edge targets may be missing, and is not conducive to the optimization of detection results. Therefore, further explorations on the problem of machine distortion correction are needed.

3.2 Expansion of the detection method of

anchors

Researches indicate that there are nine anchors which correspond to one feature point used for the original image for mapping in the process of data image extraction. Based on the pattern, the number of candidate frames generated is relatively small, and can easily lead to the omission of targets. To solve this problem and to further realize the augmentation of data, researchers should actively increase the ratio of image width to height in the process of data image target recognition, and then lay a good foundation and guarantee for the improvement of data detection accuracy[7].

4. Conclusion

Currently, the accuracy of neural network image recognition is difficult to be improved and optimized in the training process of neural network due to the lack of data. Researchers said that the data detection results can be effectively enhanced by increasing the amount of data and expanding the database during the training process. Drinks, fruits and other common daily items are taken as research objects in research process, and data augmentation methods are tested. The related results indicate that it is possible to realize the effective detection and the improvement of the detection results by constantly augmenting the data during the testing. However, the detection data may also be distorted if the barrel distortion correction and similar data augmentation methods are used in the detection process, which will adversely affect the accuracy of the detection results and prolong the detection time.

Acknowledgments

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