Enhanced Simulation of Low Illuminance Image Detail Based on Structured Forest

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Abstract: With the rapid development of information science and technology in modern society, as the most commonly used information carrier in human social activities, the demand for images is increasingly diversified and the demand is increasing. As a basic problem in image processing and computer vision, edge detection of digital images plays a very important role in image segmentation, motion analysis, target recognition and tracking. In view of the characteristics of structured forest images obtained under low illumination environment, this paper focuses on the existing related algorithms, and improves and perfects the traditional low illumination image enhancement algorithm.

1. Characteristics of Low Illuminance Images

For a long time, in the field of computer vision and pattern recognition, people have been studying the problem of image edge detection. Image edge contains a lot of important information for image recognition, which is of great significance and application value for the research of robot vision, pattern recognition, image segmentation and feature extraction. Based on this, an image edge detection algorithm based on structure forest is proposed based on low illumination image and maximum inter-class variance. the experimental results show that the contour effect obtained by this algorithm is clearer and more accurate, which can effectively reduce the noise boundary and improve the detection efficiency. in the low illumination image enhancement algorithm, the real-time stream video frame obtained by the IP network camera is processed, the structured edge detection part is applied to the image segmentation technology, and the directional watershed algorithm is combined with the super-degree contour map algorithm to realize image segmentation.

With the diversification of image acquisition tools, people demand more and more various acquisition tools, among which the quality of image acquisition is the most urgent. However, the current image acquisition tools have technical limitations, so that the final image quality is restricted by many factors, so that the obtained image has many shortcomings. Among them, it is more prominent that under the condition of low illumination, due to the lack of exposure of the surrounding environment or itself, the image details will be lost, the overall brightness is low, and the subjective visual effect is poor. Especially when this kind of image through compression, network transmission and other methods, its own quality defects will be further deteriorated in the original situation. Low illumination environment refers to the environment where the overall illumination intensity of a particular area is lower than the average level, and low illumination image refers to the image collected in a certain low illumination environment. At present, there is no accepted uniform standard to define low illumination in the field of image processing. In the field of photography, the situation where the illumination of light is less than 100 candlelight feet is usually called low illumination environment, and low illumination is the most common among the cases where the illumination of light is less than 100 candlelight feet. So far, however, there is no standard definition to define this category. therefore, in order to better describe low illumination images, people define low illumination images as images obtained when natural or artificial light sources are too dark and uneven. The collected images have many obvious features, such as the overall brightness of the image is dark, the noise is large, the definition is low, and the color

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difference and the uneven distribution of gray level are easy to appear. This characteristic makes the human eye observation feedback effect of the image poor, and it is difficult to apply it directly to the corresponding application. According to the above instructions, such images need to be enhanced to improve their subjective visual effects, and this image processing method can also be used in many other image processing algorithms. the research of low illuminance image enhancement technology has always been a hot and difficult point in the field of digital image processing. because it is ubiquitous in life and work, and the obtained low illuminance image contains many valuable information, it is urgent to study and solve it because of the lack of illumination. and the research and solution of low illumination image restoration involves many aspects in the field of digital image processing, including at least the selection of color space in color image processing, the physical model of image imaging and the selection of filters. therefore, this is also a difficult point in the field of digital image processing [1].

Figure 1 Low illumination images

2. Problems of Low Illumination Images

In real life, it is often necessary to take into account the lack of light at night, fog days and so on, resulting in various optical effects, which brings difficulties to image acquisition, which leads to a serious decline in the quality of image acquisition, resulting in noise, loss of detail information and so on. Because the collected image itself has low application value, it is difficult to achieve the desired effect in many aspects, but also brings difficulties to the subsequent processing of the image. although the research on image edge detection has a long history and the existing image edge detection algorithms are also diverse, it is still of great practical significance to be able to obtain clearer and more detailed salient contours in low illumination environment and to effectively remove the noise boundary. For this reason, many experts and scholars have invested a lot of energy in the research of image processing related theories and techniques. and in the process of digital image processing, edge detection of digital image plays an important role in many fields, image processing and computer vision [2].

Figure 2 Low illumination images

3. Application of 3. Low Illuminance Image Based on Structure Forest

Low illumination image edge detection is a valuable research topic, involving many areas. On this basis, An improved low illumination image enhancement algorithm based on Retinex theory is presented in this paper. For IP cameras, Enhanced processing of video frames captured by real-time video stream of IP network camera is realized. Then we combine the structured edge detector with the directional watershed algorithm and the super contour map algorithm. An image segmentation method based on IP network camera is implemented. That is, image enhancement, And get the image in other ways. To ensure the credibility and reliability of the above structured random forest training, The number of training samples must be sufficient and representative, and classifier training can get rich learning information. Based on the images BSDS500(Berkeley segmentation dataset), training of structured random forests. Burkley segmentation data sets are provided by the Berkeley Computer Vision Research Group, mainly for image segmentation and contour detection. And this dataset is an extension of BSDS300, Of which 200 original images were used for training, 100 for validation, 200 manually annotated images for testing, and each image has a basic real contour marked manually. This database shows two images, One for training and validation, Another aspect is used for manual annotation testing. As an image preprocessing method, Image edge detection is to better obtain clearer and more detailed contour information, Reducing the noise boundary during contour extraction, Taking full advantage of the important information contained in low illumination images, Improved edge detection algorithm based on structured forest, edge detection of low illumination images processed by the enhanced algorithm. Using the structured random forest algorithm and the maximum inter-class variance method, the edge detector is obtained. Experiments were conducted on the previously processed low illumination images, Compared with the existing algorithms, Has achieved good results, Finally, the image and data are partially simulated and compared. This paper presents an edge detection algorithm for low illumination image based on structured forest, Get a clear image, network cameras adapted to different deployment scenarios and application functions are widely used. So, the application of the improved low-illuminance image enhancement algorithm based on Retinex theory in IP network cameras is a worthy research topic. A brief introduction is given to the process of low illumination image enhancement algorithm in IP network camera application system. provides an updated and more efficient image preprocessing method for the secondary development of its various applications. For using structured edge detectors for image segmentation, A brief description of the basic principle of directional watershed algorithm and UCM algorithm is given in this paper. The experiment proves the practicability of the structured forest edge detection algorithm in image segmentation.

Figure 3 Bottom-level images of structured forests

4. Conclusions

All in all, edge is one of the most basic features of the image, which brings better convenience as the preprocessing method of the image.As an important research direction in the fields of image

processing and computer vision, edge detection technology has become a hot spot for experts and scholars at home and abroad. Although the existing image edge detection algorithms are various, it is still a practical problem whether to obtain a clearer and more detailed significant contour in low illumination environment and effectively remove the noise boundary. In this paper, an edge detection algorithm of low illumination image based on structure random forest is proposed. According to the characteristics of images acquired in low illumination environment, the existing correlation algorithms are studied and analyzed, and the traditional low illumination image enhancement algorithm is further improved and perfected. On this basis, the structural forest edge in low illumination environment is improved. the in-depth study of the low illumination image enhancement algorithm, and a large number of experimental verification and theoretical research after the proposed algorithm, through the contrast experiment with the existing image enhancement algorithm, the low illumination image has a better enhancement effect. an image enhancement algorithm based on low illuminance image enhancement algorithm is proposed to detect the structural edges of enhanced images. Based on the video frame image acquired by IP network camera, an image segmentation application system is designed and implemented, which can effectively enhance the low illumination of the simulated structured forest.

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