

Retraction

Retracted: Image Energy Saving Recognition Technology of Monitoring System Based on Ant Colony Algorithm

Wireless Communications and Mobile Computing

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] L. Bao, "Image Energy Saving Recognition Technology of Monitoring System Based on Ant Colony Algorithm," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 2178433, 8 pages, 2022.

Research Article

Image Energy Saving Recognition Technology of Monitoring System Based on Ant Colony Algorithm

Linxia Bao 

Changzhou Vocational Institute of Mechatronic Technology, Jiangsu, Changzhou 213164, China

Correspondence should be addressed to Linxia Bao; 1431104103@post.usts.edu.cn

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In order to solve the shortcomings of traditional monitoring and alarm system, the key technology of intelligent video monitoring system-image processing and recognition technology is studied. The image energy-saving recognition technology of monitoring system based on ant colony algorithm is proposed. The ant colony algorithm is used to segment the image, extract the suspicious area, and then deal with the suspicious area separately by using the reasoning based on default rules in artificial intelligence. Using the trained neural network, the recognition experiment is carried out on 40 samples, and the recognition accuracy is more than 93%, which shows that it is very effective to use 7 invariant moments in the target image area as the characteristic parameters of target recognition. The microcomputer 2 renewal for a single target area is identified by using a moment invariant calculation force method and neural network. The execution time of the test on the microcomputer of Saijie 1.0 is microsecond. The experiment proves that it is practical and reliable, meets the real-time requirements, and can transmit the alarm signal and suspicious area image to the alarm center through the network.

1. Introduction

Intelligent video monitoring and alarm devices are widely used in military, public security, banks, customs, factories, transportation, hotels and restaurants, important warehouses, stadiums and gymnasiums, intelligent buildings, civilized communities, scenic spots, forest care, airports, and other places and fields, which can effectively prevent the occurrence of criminal cases and natural disasters (fires). It is an important high-tech means and technology to ensure public safety in modern society, as shown in Figure 1 [1]. At present, China's video monitoring and alarm systems mainly include the following three types:

- (1) *Traditional Closed-Circuit Television Monitoring System—The Most Original Image Monitoring System*. It is mainly composed of camera, video matrix, picture splitter, monitor, video recorder, etc. Each monitor requires a staff member to carefully scan and monitor the scene image transmitted by the on-site camera to the director's viewing room with his eyes for 24 hours. Due to the influence of human

eye fatigue and emotional fluctuation for a long time, underreporting often occurs [2]. In addition, the video tape recorded in serial in the form of analog signal is used for image storage, which is nonselective storage. The useless amount of recorded information is too large, and the video tape needs to be replaced frequently. Moreover, the video information stored in the form of video tape cannot realize the rapid retrieval and analysis of image useful feature information

- (2) *Digital Video Monitoring and Alarm System* [3]. Mainly composed of camera, various monitoring and alarm probes, data equipment, multimedia PC monitoring terminal, etc. Compared with traditional analog monitoring, digital monitoring has many advantages: suitable for long-distance transmission; the data is easy to save and search; it improves the image quality and monitoring efficiency. In China, in recent years, there have been some digital video recording equipment specially used for banks, but the price is high, and it does not have the function

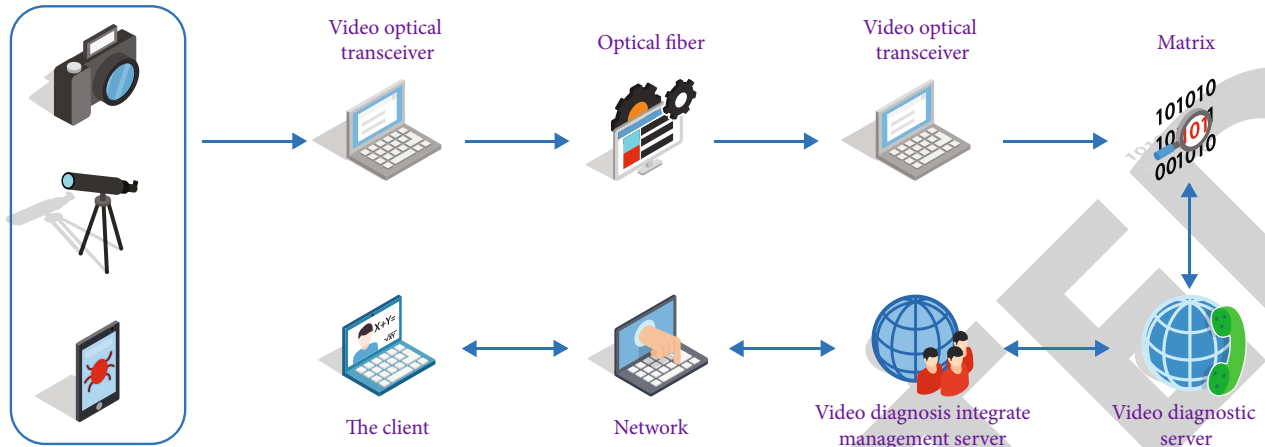


FIGURE 1: Intelligent detection and diagnosis system of monitoring video image.

of image real-time recognition and alarm. In fact, it is only an updated product of traditional analog video recording equipment

- (3) *Infrared Sensor Alarm System*. That is, a sensor is placed at a specific position (such as doors and windows). When the physical quantity (such as temperature) at the acquisition point reaches the alarm threshold, it will send an alarm signal to the central control computer. The advantages of this alarm system are convenient installation, rapid response, and simple system, but its scope of application is small and prone to false alarm, which is caused by being too sensitive to single point noise. This kind of alarm system cannot distinguish foreign objects (such as people, animals, or vehicles) [4]. In order to prevent the frequent occurrence of false alarm, the method of reducing the sensitivity of the sensor can be adopted, but it is easy to miss the alarm. The traditional alarm system has inherent defects in preventing false alarm and missing alarm, which limits its application in complex situations, requiring certain dynamic control ability and high intelligence. In view of the urgent demand for intelligent alarm system and the shortcomings of existing alarm system, this study studies the key technology of intelligent video monitoring system—image processing and recognition technology, in order to realize the real-time and accurate identification of illegal intrusion by intelligent video monitoring system. The system uses the computer to replace the monitoring personnel to complete the monitoring task, that is, the computer system is responsible for completing the automatic detection and classification of moving targets and is responsible for maintaining the image sequence database. Only when an abnormal situation occurs, the computer system sends an alarm and transmits the image sequence stored in the database containing the alarm reason to the monitoring center. This method not only saves manpower but also overcomes possible human errors. In addition, the intelligent video monitoring system based on image recognition function can realize all-weather and all

scene monitoring of the monitored area, which overcomes the defects that the traditional closed-circuit television system and digital video monitoring and alarm system require 24-hour monitoring by staff and the sensor cannot monitor in a wide range. In short, the intelligent video monitoring device can significantly reduce the consumption of human and material resources and realize unattended, which is a great innovation to the traditional monitoring and alarm concept and can prevent the occurrence of various criminal cases. The direct and indirect economic and social benefits are difficult to estimate [5]. The image real-time processing and recognition technology involved in this paper is one of the practical application branches of artificial intelligence technology. Its theory is constantly developing and improving, which is the research hotspot of Chinese and foreign scholars. Therefore, it is of great academic value, social, and economic significance to research and develop fast image processing and recognition methods and realize industrialization in the field of video surveillance

2. Literature Review

Automatic monitoring is mainly applied to the monitoring of illegal intrusion, traffic volume, security monitoring of people entering and leaving the gate, identification of vehicle license plate, natural disaster (fire) monitoring, etc. Yan and others found that the image processing and recognition technology based on intelligent video surveillance system mainly include two parts: detection and recognition of illegal intrusion targets [6]. Target detection is to eliminate the interference of shadow, illumination, and other factors and detect the intrusion target; recognition is to classify the detected targets to prevent false alarm and provide accurate information to the alarm center at the same time. Huang and others believe that at present, foreign intelligent digital video surveillance technology is basically still in the research and development stage, only a few products have been put into application, and some countries (Japan and Germany) have begun to study robot security [7]. Wang and Jiao found that

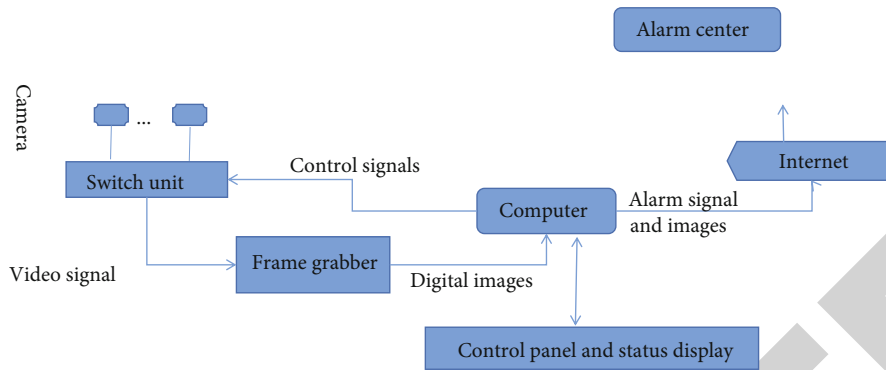


FIGURE 2: Composition diagram of fire and antitheft intelligent monitoring and alarm system.

China is just in its infancy. In recent years, some digital video recording equipment specially used for banks have emerged, but the price is high and does not have the function of image real-time recognition and alarm [8]. AI found that in fact, it is only an updated product of traditional analog video recording equipment [9]. Liao and others believe that although some scientific research institutes in China are also carrying out research in this field, all the results are still only in the laboratory, and no mature products have been put on the market [10]. Zhang found that the development of video surveillance system has roughly experienced three stages. Before the early 1990s, the closed-circuit television monitoring system mainly based on analog equipment was called the first generation analog monitoring system [11]. In the mid-1990s, with the improvement of computer processing ability and the development of video technology, people used the high-speed data processing ability of computer to collect and process video and realized the multipicture display of image by using the high resolution of display, which greatly improved the image quality. This multimedia console system based on PC is called the second generation digital local video monitoring system. In the late 1990s, with the rapid improvement of network bandwidth, computer processing capacity, and storage capacity, as well as the emergence of various practical video processing technologies, video surveillance entered the fully digital network era, which is called the third generation remote video surveillance system. Hu and others found that the third generation video surveillance system, based on the network, takes the compression, transmission, storage, and playback of digital video as the core, and features intelligent and practical image analysis, has triggered a technological revolution in the video surveillance industry, which has been highly valued by academia, industry, and application departments [12]. From 1996 to 1999, the U.S. Defense Advanced Research Projects Agency (DARPA) funded Carnegie Mellon University, David Sarnoff research center and other famous universities and companies to jointly develop the video surveillance and monitoring system V Sam, which is currently in the trial stage. Li and others found that its main functions are integrating various types of sensors to carry out all-round day and night monitoring of the monitoring area. It has the ability of video analysis and processing, which can not only detect and identify the types of abnormal

objects but also analyze and predict human activities and automatically prompt and alarm according to the harmfulness of the behavior of moving objects [13]. Cong and others believe that it has an advanced network transmission system composed of Internet, intranet, and LAN; using geographic information and 3D modeling technology to provide visual graphical operation interface; the airborne aerial camera can aim from the cloud at the ground monitoring target without regular manual manipulation, so as to realize the long-term monitoring of important targets [14].

3. Method

The hardware composition of the intelligent monitoring and alarm system is shown in Figure 2. The software is compiled in the VC6.0 environment. The image of the monitoring area is collected by Microsoft VFW, then compared with the reference image, and the suspicious bright area part a is segmented by the threshold method; then collect the sequence image, and also take out the suspicious bright area part B; according to the change of suspicious bright area, artificial intelligence rule reasoning is adopted to judge and eliminate interference. Socket programming is used to correctly alarm through the network. The system can monitor in the background. During operation, an icon is displayed in the static notification area at the right end of the taskbar and respond to the user's mouse action, reflecting the friendly interface style of windows, the target shape in the image can be expressed in two ways: the boundary of the target or the area covered by the target using edge detection and edge tracking technology can realize the boundary expression of the target shape, while using the area covered by the target to express the shape needs to divide the image into several areas with some uniformity. It can be seen that image segmentation is also an image analysis method like edge detection. There are often some areas with some uniformity in the actual image, such as the uniformity of gray texture distribution, the feature vector formed by this consistency can be used to distinguish each region of the image. Image segmentation uses these feature vectors to test the consistency of the region, so as to achieve the purpose of dividing the image into different regions.

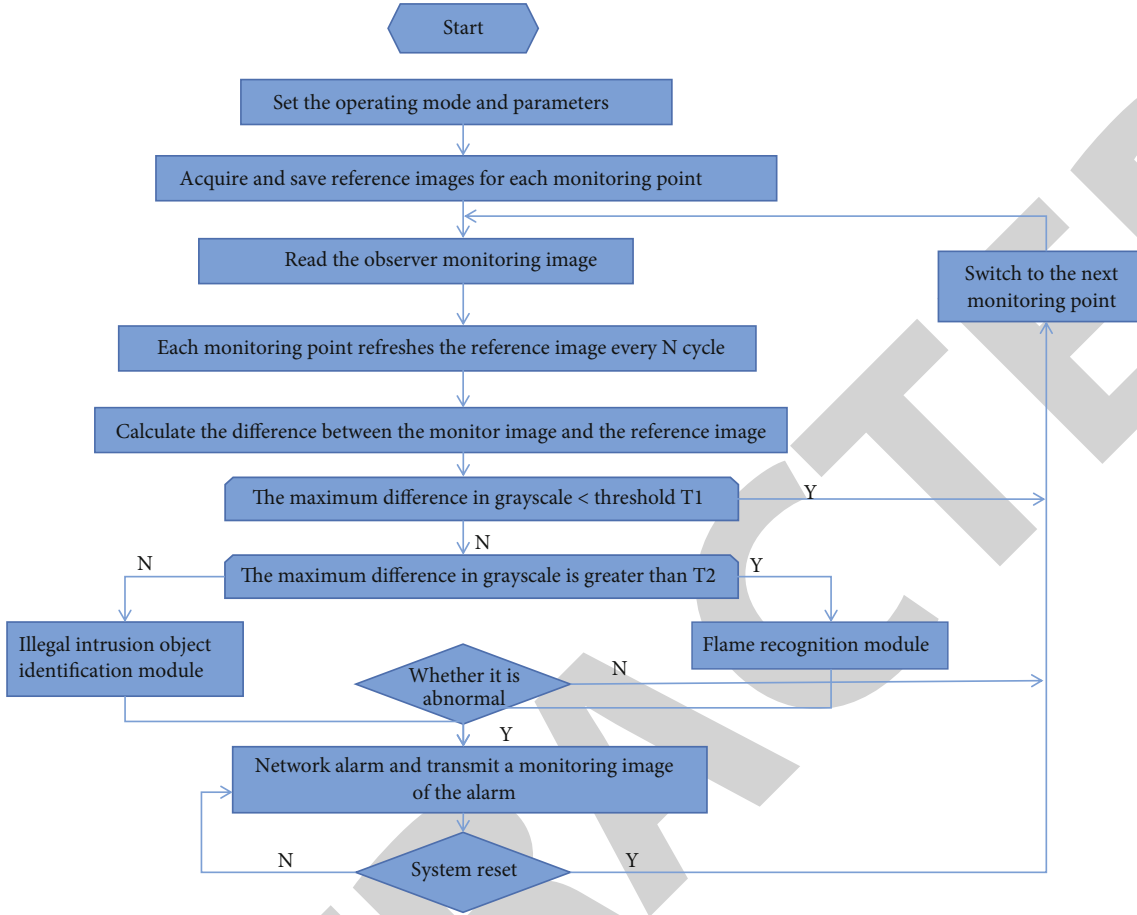


FIGURE 3: System software flow chart.

Segmentation technology can be divided into three categories: (1) local technology is based on the local characteristics of pixels and their neighbors; (2) global technology, which takes global information, such as histogram, as the basis of image segmentation; (3) split, merge, and region growth technology is based on the consistency and geometric proximity of regions: if two regions are similar and adjacent, they can be merged. A region without consistency can be split into two subregions. As long as consistency can be maintained, pixels can be added to one region. This paper uses global technology. The optimal entropy threshold image segmentation method of ant colony algorithm is adopted [15]. When the Shannon entropy concept in information theory is applied to image segmentation, the entropy of image gray histogram is measured to find the best threshold. Its starting point is to maximize the amount of information distributed between target and background in the image. When ant colony algorithm is applied to image segmentation, because there are multiple objects on the same background image, it is segmented with double threshold, in which the gray range of image histogram is $\{0, 1 \dots, m\}$ [16]. Algorithm design: (1) the coding encodes each chromosome into 16 bits. The first 8 bits represent a threshold value, and the last 8 bits represent another threshold value.

The value of the initial generation entry is randomly generated, and its corresponding fitness value also has different levels; (2) sample string model. Double threshold segmentation belongs to multiparameter genetic programming, where the number of sample strings is 40 and the breeding algebra is 180; (3) decoding. Decode the binary chromosome array into two numbers of 0 ~ 255 as double threshold, and the fitness function is shown in the following equation.

$$H(t_1, t_2) = 1n \left[\sum_{i=0}^{t_1} P_i \right] + 1n \left[\sum_{i=t_1+1}^{t_2} p_i \right]. \quad (1)$$

Among them, T_1 and T_2 are double thresholds, and the linear calibration of fitness function is adopted at the same time crossover: double point crossover is adopted, and the two randomly generated intersections are located in the first 8 places and the last 8 places, respectively. The crossover probability is 0.6 termination criterion: in the double threshold segmentation, it is specified that the highest fitness value in the population after 30 generations of evolution has not changed as a stable condition. Selection: according to the convergence theorem of genetic algorithm, gambling wheel method (Monte Carlo method) is adopted first, and then

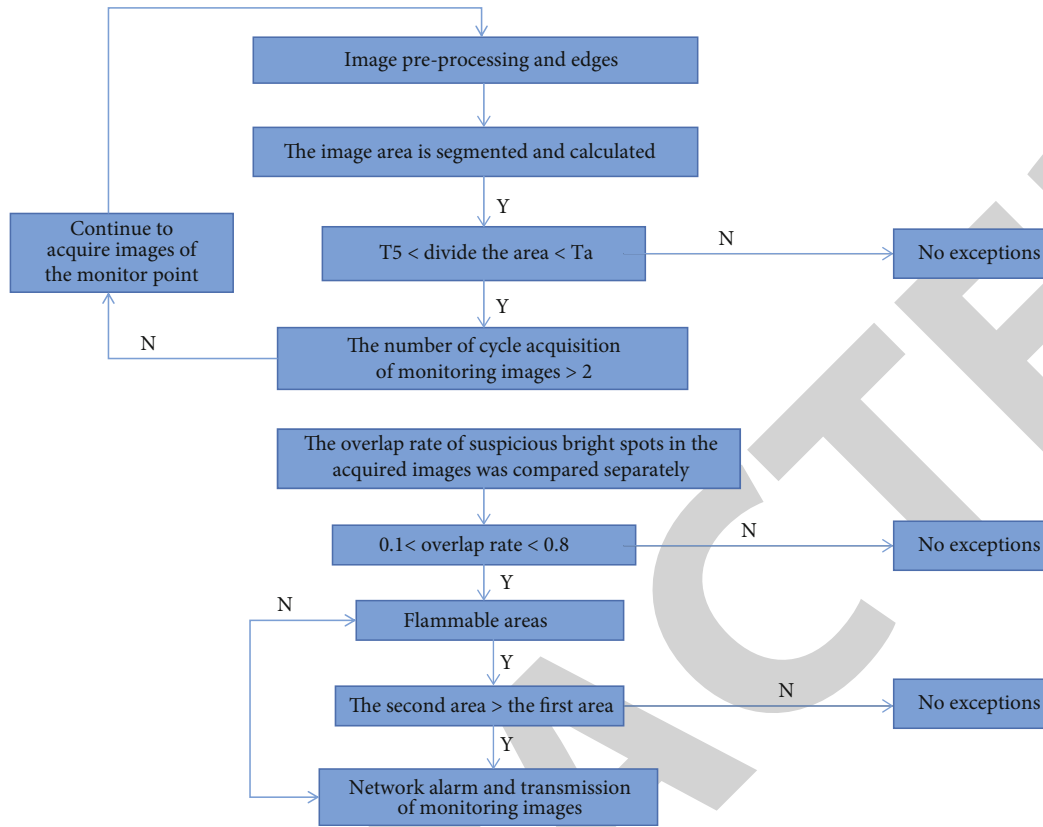


FIGURE 4: Flow chart of flame identification module.

TABLE 1: Calculation of characteristic parameters of moment invariant.

Moment invariant Experimental data Image	(g)	(h)	(i)	(j)	(k)
LgM1	-0.4493	-0.4556	-0.4604	-0.4546	-0.4604
LgM2	-0.9982	-1.0516	-1.0629	-1.9205	-1.0629
LgM3	-4.6315	-3.7376	-3.8563	-3.4282	-3.8563
LgM4	-4.8582	-4.6385	-4.6479	-3.9470	-4.6479
LgM5	-9.6033	-18.0696	-9.2236	-7.6639	-9.2236
LgM6	-5.3606	-5.7165	-6.1398	-4.6007	-6.1398
LgM7	-11.0972	-8.8267	-8.9554	-8.0830	-8.9554

TABLE 2: Calculation of characteristic parameters of moment invariant.

Moment invariant Experimental data Image	(a)	(b)	(c)	(d)	(e)	(f)
LgM1	-0.7982	-0.7982	-0.77833	-0.77807	-0.4526	-0.4483
LgM2	-6.8578	-8.9085	0	0	-1.0054	-0.9932
LgM3	-7.3589	-9.4085	0	0	-4.4018	-4.6315
LgM4	-11.1593	-13.6156	0	0	-4.6174	-4.8582
LgM5	-20.4174	-25.1276	0	0	-9.1269	-9.6033
LgM6	-14.5872	-18.0696	0	0	-5.1251	-5.3607
LgM7	-30.1064	-33.3836	0	0	-11.1638	-11.0772

TABLE 3: Experimental data.

Moment invariant Experimental data Image	(a)	(b)	(c)
LgM1	-3.0720472248	-3 .05 : 29369757	-2.8434009755
LgM2	-7.3756794601	-7.15 12717047	-5.8844750374
LgM3	-1 0.0943588710	-10.6185033413	-11.9564550592
LgM4	-10.9508587974	-10.9429140892	-9.8978354503
LgM5	-21.4947777840	-21.74976685 17	-21.4489522544
LgM6	-14.7398863166	-14.91685158190	-12.8402962783
LgM7	-21.7840784393	-22.0958231916	-21 .4513965737

TABLE 4: Experimental data.

Moment invariant Experimental data Image	(d)	(e)	(f)
LgM1	-2.8111075132	-2 9633598066	-2.9402559191
LgM2	-5.7927909715	-6.13.49733493	-6.0469567952
LgM3	-11.3690981159	-10.2708106780	-10.1908918591
LgM4	-10.0887687675	-10.8. 540537922	-10.70861 98607
LgM5	-21 .5068471769	-21 .4543946502	-21.1848850787
LgM6	-12.9903970769	-14.0924321539	-13.8675128608
LgM7	-21.3450030908	-21.5179255189	-21.3592610006

TABLE 5: Experimental results.

Training sequence	Number of training samples	Number of test samples	Number of errors	Error rate
The first time	14	12	2	0.17
The second time	16	15	1	0.07
Third time	20	15	0	0

elite strategy is adopted. Variation: the probability of variation is 0.1. The above parameters such as population model, crossover probability, mutation probability, and stability algebra are summarized and designed according to the results of many experiments [17].

In recognition, if only the current image is compared with the reference image (the background image when there is no fire or illegal intrusion object), it is difficult to obtain the ideal effect, because after comparing the current image with the reference image, only the contour of the object can be obtained. In image processing, the contour can only describe the shape of the object, and it is difficult to correctly judge the monitoring target by shape alone; therefore, we should use sequence images and some empirical default rules to judge. The system program flow chart is shown in Figure 3.

The main body of the fire is the flame. The flame appears as a bright area on the collected image. To judge the flame from a bright area, we should see that the essential feature of the flame different from the general bright area is the

irregularity of the change of the bright area. The flame not only has an irregular shape but also its change is arbitrary. However, the flame has a feature that the suspicious bright areas of the two collected images overlap, but it is impossible to completely overlap. The program flow of flame identification module is shown in Figure 4 [18].

If the maximum gray difference between the current image and the reference image is less than the threshold T_i , there is no target. Because the current image may only change slightly on the basis of the reference image due to the influence of the environment. For example, when the weather changes slightly, the gray level of the reference image and the background of the current image will change. At this time, the monitoring target with too small maximum gray level difference needs to be regarded as a thousand disturbance source.

4. Experiment and Discussion

In order to verify the correctness of selecting target moment invariant shape feature as target recognition feature, seven moment invariant feature parameters are calculated by using the program designed in this paper [19, 20]. The calculation results are shown in Tables 1 and 2. Lgm1 ~ lgm7 in Tables 1 and 2 are the seven invariant moments after logarithmic operation. As can be seen from the data in Tables 1 and 2, (a), (b) the seven data of two circular regions are similar, (c), (d) the seven invariant moments of two square regions are similar, (e), (f), (g) the seven invariant moments of three long regions are similar, (h), (I), (J), (k); the invariant moments of four human shapes are similar, and the data

of (f) and (g), (i), and (k) are equal, respectively. The moment invariants of target regions with different shapes are very different, which shows that the 7-8 moment invariants of target regions with similar shapes and different sizes are similar, and the 7 moment invariants of target regions with the same shape and different angles are the same, which shows that the moment invariants have rotation and translation invariance and can be used as the effective shape feature parameters of target regions [21, 22].

For two human body images and two vehicle images, Tables 3 and 4 show their seven moment invariant characteristic data. It can be seen from the data in the table that the images of the two animals have great correlation. The two images of human body have great correlation. The images of the two vehicles also have great correlation. The moment invariant data between the three are quite different [23]. Therefore, using the seven moment invariants of the image region as the recognition feature parameters, people, animals, and vehicles can be effectively distinguished [24].

For the training and test of moving target recognition artificial neural network, first, the moving target collected by digital camera is used as the training sample. The number of samples is 14 (8 people, 4 animals, and 2 vehicles). After 2400 times of training, the error is less than 0.0003. In the test stage of neural network, 12 samples (8 people, 2 animals, and 2 vehicles) who did not participate in the training were prepared, and there were two misidentifications in the test results. Then, the neural network was trained twice, with the number of samples being 16 and 20, respectively. The training results are shown in Table 5 [25]. The test samples shown in the table are all samples that have not participated in the training. It can be seen from the data in the table that when the number of neural network training samples is increased, the pattern recognition ability of the network is gradually improved. Later, the trained neural network is used to recognize 40 samples, and the recognition accuracy is more than 93%, which shows that it is very effective to use 7 invariant moments in the target image area as the characteristic parameters of target recognition. The micro-computer 2 renewal for a single target area is identified by using a moment invariant calculation force method and neural network. The execution time of the test on the micro-computer of Saijie 1.0 is microsecond.

5. Conclusion

This paper presents an intelligent handwriting editing method based on multilevel interaction structure understanding. This method first obtains characters by segmentation from bottom to top, extracts ink lines by histogram projection, implicitly calculates all potential text lines, then carries out segment understanding through spatial relationship, and preliminarily extracts single words, lines, and segments to obtain the implicit spatial structure of handwriting. Then, the composition information is accurately segmented by using the overall information from top to bottom, and the extracted information is expressed into a multilevel structure for handwriting editing and recognition. The use of natural interaction technology makes the editing based

on structural understanding automatic and intelligent, frees users from the task of maintaining the correlation between handwriting, and reduces users' cognitive burden. At present, this paper has carried out preliminary research on the structural analysis and editing of handwriting and successfully realized these technologies. In the future, we need to do further research on these contents, so that they can finally be independent of specific applications and suitable for the whole pen interface platform.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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