Research and Implementation of Face Recognition in Remote Intelligent Monitoring System

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Abstract: in This Paper, a Remote Intelligent Video Monitoring System is Designed. by Adding Face Recognition Technology, the Interested Faces in the Video Are Extracted and Recognized. Considering the Convenience and Cost Saving, the System Uses Embedded Microprocessor Platform and Linux as the Operating System. in the Bottom Layer, V4l2 is Used to Drive Camera Input and Tcp / Ip Network Communication Protocol is Used for Transmission. the System Adopts B / s Architecture, and Can View the Real-Time Video Monitoring Picture in the Form of Browser. in Order to Improve the Limitations of Common Video Surveillance, Face Recognition Technology is Added to Enable It to Independently Screen out the Information of People Appearing in the Video. Adaboost Algorithm is Used to Detect the Face, and Then Lbp Algorithm is Used to Recognize the Detected Face by Training the Face Model Database. Traditional Passive Video Monitoring System Has Some Problems, Such as Low Utilization of Video Data, Waste of Resources, Increase of Labor Cost and So on. Compared with It, the Video Monitoring System Based on Face Recognition Can Identify the Person Information in the Video Actively, Save the Face Data, and Users Can Easily View the Person Information in the Video, Which Has Better Practicability.

1. Introduction

In Recent Years, with the Use of Video Surveillance in More and More Occasions, the Video Surveillance Market Also Presents an Explosive Growth[1]. with the Development of Society and the Improvement of People's Safety Awareness, Video Monitoring Has Brought Great Convenience, and It Has Attracted More and More Attention. It Can Be Used in Public Places, Civilian Buildings, Military, Agricultural Greenhouse Monitoring and Other Fields. with the Improvement of Modern Technology, the Traditional Video Monitoring Can Not Meet the Needs of People. Traditional Video Monitoring Technology is Single, Which Leads to a Lot of Waste of Resources. San Diego National Laboratory Has Done a Research on Video Monitoring. When People View the Video for 22 Minutes, More Than 95% of the Information in the Video is Basically Ignored by the Naked Eye [2]. When There is an Accident That Needs to View the Video, People Focus on the Key Information, Which Will Waste a Lot of Manpower and Time. after the Emergence of Intelligent Video Monitoring Technology, It Solves This Problem Well. Using Computer Vision Technology to Process the Key Information in the Video, and Using Related Algorithms for Target Detection, Target Tracking, Target Recognition, Behavior Analysis . Face Recognition Technology Can Effectively Compare Personnel Information to Achieve Efficient Intelligent Personnel Analysis and Filtering. Adaboost Algorithm of Face Detection is Equivalent to Preprocessing of Face Recognition, I.e. Extracting Face Feature Area [3]. Face Recognition Algorithm is Conducive to Pca's Dimension Reduction of Face Area, Then Extracting Face Sample Feature Value with Lbp Binary Mode, and Finally Training Face Database with Svm . in Reference, Lsh and Log Features Are Fused to Improve the Effect of Light Changes on Face Recognition. This System Combines Embedded Technology, Face Recognition Technology, Network Communication Technology, Design a Remote Intelligent Monitoring System. Compared with the Traditional Wired Video Monitoring, This Paper Uses Tcp / Ip Network Communication Protocol and B / s Mode to Realize

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Remote Video Monitoring. in the Case of Real-Time, Face Recognition Algorithm is Added to Screen People. the System Can Recognize Strange Faces and Save the Photos. Users Can View the Illegal People At Any Time.

2. System Scheme Design

Based on the embedded microprocessor platform, this paper designs a remote intelligent video monitoring system which is easy to use, economical and practical, and has stable performance. The system can view the real-time monitoring video information remotely, and can automatically identify and filter the face. It mainly has the following functions:

2.1 B / s Mode

Users can view the monitoring video information of the camera in real time through the form of Internet. Generally, the traditional video monitoring is realized by the way of wiring. The cost of wiring is high, and it can not be realized in some special fields. The local area network is adopted, which is convenient for installation and low cost, and is more convenient for users.

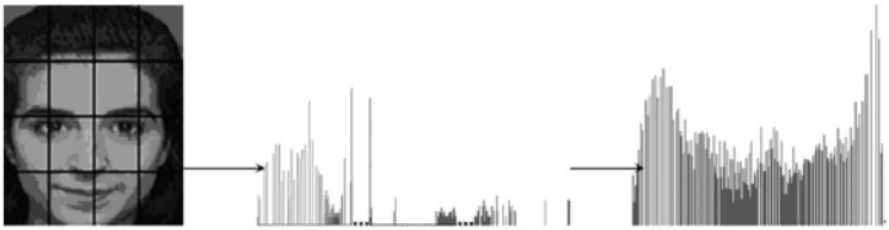

Fig.1 Face Feature Extraction Diagram

2.2 Add Face Recognition Technology to Video Monitoring

To achieve an intelligent video monitoring system. The traditional video surveillance system has the characteristics of large storage, difficult to filter important information, resulting in a lot of waste of resources. In this system, people in the surveillance video can be screened. If strangers are identified, they can be photographed and saved, so that users can easily view the intruders.

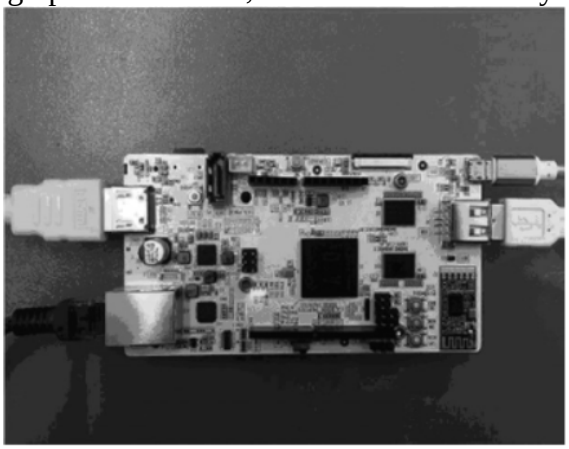

Fig.2 Embedded Platform

2.3 The System Adopts Embedded Microprocessor Platform

Embedded system has low cost, stable performance, and is easy to install and use in various occasions. It has rich peripheral interfaces, which can expand more functions according to the demand. The overall scheme structure of the system is shown in Figure 1. First, the bottom loading driver enables the camera to collect video data[4]. After processing, the data is transmitted to the server through the TCP / IP network protocol, and the user enters the IP address Address and port number to view the real-time video signal. At the same time, the face recognition algorithm is added. First, AdaBoost algorithm is used to detect the face in the monitoring area, calibrate the frame of

the face, and then LBP algorithm is used to recognize the face. Through the establishment of the face database, if the face is recognized in the database, nothing will be done. If the face is not recognized in the database, it will be deemed as an illegal intruder, so as to ensure that Save the information of the intruder. The user can click the button event to view the information of the intruder.

3. Remote Video Monitoring Design

The system uses the arm processor of cortex **-** A8 architecture, transplants the system based on Linux 2.6 kernel to the arm development board, sets up the system environment, and makes the development board function can be used as a small PC. Because it involves face recognition, it is necessary to transplant opencv function library to system environment. It takes up a large amount of system memory, so it needs to use fdisk command to expand the external TF card to the system memory before migration. The system uses opencv version 2.4.9. Using v4l2 to drive USB camera to realize video data acquisition. In v4l2, the video device is treated as a file, and the camera is opened in blocking or non blocking mode [5]. If the video device is called in non blocking mode, the driver will still return the cache (dqbuff) to the application even if no information is captured. After opening the video device, you can modify the default parameters of the video device to get the desired output results. Socket socket is used to realize remote communication between server and client. Socket, originated from UNIX, is a special file and an intermediate software abstraction layer between application layer and TCP / IP protocol [10]. Its communication principle is similar to the principle of making a phone call. Through a series of related functions, address binding, monitoring and connection establishment are realized. The server side will be blocked until there is no connection request, which can save resources. In the network protocol, TCP is chosen as the communication protocol. Compared with UDP protocol, it has better data transmission security and does not lose the corresponding video data. In order to meet the needs of multiple users to view information, the system adopts multi-threaded technology. Each new user request will create a thread, which can view data for multiple users at the same time.

4. Face Recognition Design

At present, face recognition algorithms mainly include PCA algorithm, convolutional neural network algorithm, LBP algorithm and so on. Because the system uses the embedded microprocessor platform, considering the real-time, recognition rate, stability and other factors of face recognition, the LBP algorithm is finally selected, which has low time complexity, high recognition rate and good robustness. Before face recognition, we need to detect the face first, so we choose to use AdaBoost algorithm to detect the face. AdaBoost, also known as adaptive enhancer, is iterated by several classifiers. Its adaption lies in that the weight of the samples that the previous basic classifier was wrongly classified will increase, while the weight of the samples that were correctly classified will decrease, and it will be used again to train the next basic classifier, and it will not stop until the expected acceptable error rate is reached, and the final strong classifier will be obtained[6]. In detection, Haar like features are used for feature matching. Each image basically has hundreds of thousands of Haar like features. Therefore, integral graph is used to accelerate feature matching, so as to improve the efficiency of face detection. In face recognition, LBP algorithm is used. LBP is local binary mode, which has good rotation invariance and gray invariance. By extracting the local texture features of the face to recognize the face, the threshold segmentation method is used to divide the face equally, and LBP algorithm is used to calculate the LBP value of each small block to the corresponding histogram of the face.

5. Real Time Optimization

Because this system uses embedded microprocessor platform, its processing speed is relatively slower than PC. The operation time of face recognition algorithm is very complex. If it is not

optimized, the delay of face recognition in the test will reach 400 ms[7]. this delay is a relatively large system which optimizes the running speed of the program from the hardware and software. In hardware, because the embedded platform is used, a special memory can be allocated to the program directly. If the embedded board is directly used by the system, a lot of resources can be allocated to the program to improve the operation efficiency. After passing the test, the delay of face recognition is reduced to about 180 Ms. In software, because face recognition is based on feature matching by traversing every pixel of an image, the input size of the image seriously affects the efficiency of face recognition. In image input, the system transforms the image of nearly 300000 pixels into the image output of more than 70000 pixels by default input, which will greatly reduce the special features The amount of operation of the token matching. After passing the test, the final delay is reduced to about 87 MS, which can be accepted by users.

6. Experimental Results and Analysis

After connecting the power cable and network cable, set the IP address of the development board. Enter the IP address and port number of the development board through the browser of PC or mobile phone, and then log in to the client. The real-time monitoring screen uses HTML5 + CSS + JS to build a user interface, which can view the real-time video signal on the client side, and can take photos and save them. At the same time of real-time monitoring, the face recognition algorithm is running in the background, and the information of the identified personnel can be called up by clicking the “view the identified personnel” button. For the face matching database trained by LBP algorithm, the matching database is labeled from 1[8]. It is to match the face in the video with the training database, and display the personnel information accurately by labeling. Because the two people in the image are in the face database, the system shows that their digital labels are 35, 37. In the face recognition rate, although the system uses the embedded microprocessor platform, it is also quite good in the recognition rate. Through the test, the face recognition rate of the system reaches 87.4%. The experimental results show that the system has good stability and can effectively identify the personnel information in the video monitoring system

7. Conclusion

This system uses embedded microprocessor as the platform to realize the remote intelligent monitoring system based on face recognition[9]. Through the test, the system can well apply face recognition technology to the video monitoring system, can view the real-time video picture, and can effectively view the information of people who have illegally intruded in the past video, the whole system has good robustness

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