International Journal of Computer and Organization Trends
ISSN: 2249 – 2593 /doi:10.14445/22492593/IJCOT-V11I2P304

Volume 11 Issue 2, 12-13, Mar-April 2021

Design of Street Monitoring System Based On Open Source Platform

Zhekai Cao [#1], Chunyan Zhang [*2], Qianhao Wang [#3], Jiawei Ma [#4], Yunxiang Lu[#5]
(School of mechanical and automotive engineering, Shanghai University of engineering and technology, China)

Received Date: 03 March 2021
Revised Date: 15 April 2021
Accepted Date: 18 April 2021

Abstract *— With the improvement of Internet technology and computer performance, the street monitoring system can add the functions of face image matching and human posture judgment database to record the situation of people entering and leaving the street and judge whether residents have unexpected situations such as accidental faint. Improve the safety of the street. This system takes the open-source platform as the design basis, which provides a certain reference for the design of the street monitoring system.*

Keywords *— Monitoring system; image matching; open-source platform*

I. INTRODUCTION

With the development of Internet communication technology, the Internet has gradually become an important infrastructure closely related to national development and people's life and has had a far-reaching impact on economic construction and the improvement of people's living standards. [1] An intelligent community based on Internet technology has become an important trend of social development in the future. [2].

The residential street monitoring system belongs to a research direction carried out by the intelligent community. It can not only protect the daily life of residents but also facilitate rapid rescue in case of emergency. Different from the traditional monitoring system, which includes camera monitoring and data storage, this system further provides the function of face recognition in and out of the street, as well as the human posture judgment of the monitoring equipment in the street, so as to further improve the street safety performance. At the same time, the system is designed according to the open-source data platform, which is convenient for designers to break through the technical bottleneck.

II. SYSTEMS COMPOSITION

The system consists of the camera module, face recognition system, attitude judgment system, and monitoring program.

Taking residents entering the street as an example to show the specific functions of the system are as follows: 1. Resints enter the entrance of the street for face recognition to judge whether the resident is a resident in the street. 2. Residents walking in the street enter posture identification. If it is judged that a resident falls, an instruction will be sent to the program of the monitoring side. The interface of the monitoring side will prompt the staff to check the situation, and it will be up to the staff to judge whether rescue is needed or not. The composition of the system is shown in figure 1.

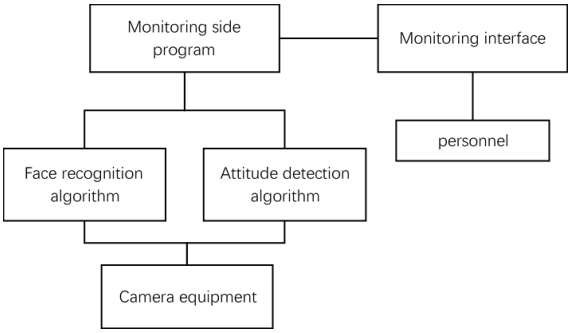

Fig.1 System composition

The software development platform of the system adopts Microsoft Visual Studio. The platform is a basic and complete set of development tools, which includes most of the tools needed in the whole software life cycle, such as UML tools, code control tools, integrated development environment (IDE), and so on. [3]At the same time, the platform is free for non-commercial individuals, so it is suitable for individuals to work on software. The system uses the Net framework of the platform as the development work of the host computer interface, and the interface between the camera equipment and the monitoring host adopts the form of optical cable transmission to ensure the security and stability of the equipment image transmission.

The algorithm implementation and decision of the face recognition part are determined by the corresponding host at the entrance of the street. For the monitoring host, only the personnel authentication information and authentication time sent by the host of the face recognition system are obtained. At the same time, the information exists in the back-end database of the monitoring program, and the staff of the monitoring office is unable to query in general, and the inquiry needs to submit an application to the superior.

For the part of human posture recognition,[4-5] in order to avoid the high cost of system design, the algorithm recognition is carried out by the host computer of the monitoring end. At the same time, the corresponding host computer should be arranged to process the image data according to the specific time of

the algorithm and the number of camera equipment in the street to avoid the low running efficiency of the host computer on the monitoring side.

The interface of the monitoring end of the system should include the login function of security personnel, the block display of the monitoring street, and the alarm function of attitude judgment. Security personnel login function can use fingerprint module to identify and judge or face image matching algorithm, and its purpose is to prevent personnel except for staff accidents from obtaining monitoring rights. The street monitoring block display enables the entire street information to be included in the same display interface and should be set to display location information for camera label labels.

The research of face recognition algorithm and human posture determination algorithm will be further described in the next part.

III. FACE RECOGNITION AND POSE DETERMINATION

A. Face recognition algorithm recommendation

Face recognition is divided into two parts: image preprocessing and face recognition algorithm. Considering the relatively small number of people in the street, AKAZE algorithm can be used for image matching. The algorithm is improved on the basis of KAZE algorithm. The specific improvements are as follows: 1. Making use of the advantages of nonlinear diffusion filtering to obtain the characteristics of low computational requirements, so the author introduces the fast display diffusion mathematical framework FED to quickly solve the partial differential equation. Using FED to establish scale space is faster than other nonlinear models at present, and it is more accurate than AOS. 2. An efficient improved local difference binary descriptor (M-LDB) is introduced, which increases the robustness of rotation and scale invariance compared with the original LDB, and increases the uniqueness of the scale-space gradient information constructed by FED.[6] Compared with SIFT and SURF algorithm, the AKAZE algorithm is faster and has higher repeatability and robustness compared with the ORB and BRISK algorithm.[7]

The implementation of the specific algorithm can be developed by calling the open-source OpenCV vision library. [8]The algorithm has good robustness in image scale transformation and rotation transformation, and the accuracy of face recognition is relatively high.

B. Human Posture Estimation-OpenPose

Human Posture Estimation estimates the posture of the human body by correctly connecting the key points that have been detected in the image.

Open Pose Human posture recognition Project is an open-source library developed by (CMU) of Carnegie Mellon University based on convolution neural networks and supervised learning and based on Caffe. [9]It can realize the posture estimation of human movement, facial expression, finger movement, and so on. It is suitable for a single person and multi-person and has excellent robustness. It is the first real-time multi-person two-dimensional attitude estimation application based on deep learning in the world.

IV. CONCLUSION

With the continuous research and development of the material industry and the improvement of computer technology, the transmission of information under the connection of the Internet is becoming easier and easier, and the street monitoring system is also developing towards the direction of intelligence. The system adds face recognition and attitude determination to the monitoring system, which integrates the access control with the street monitoring system and improves the security of the street. The development of software and algorithms based on open source platforms and third-party libraries also increases the development cost of designers.

ACKNOWLEDGMENT

This research was partly supported by the Shanghai university student innovation and entrepreneurship project (Grant No. cs2001014).

REFERENCE

[1] Ye Ning. The application of Internet of things technology in the smart home under the background of big data [J]. Journal of Jiamusi Vocational College, 2021 minute 37 (04)(2021) 52-53.

[2] Zheng Mengwang. On the Application of Intelligent Video Surveillance Technology in Public Security Management of Residential District [J]. Journal of Hunan Police College,32 (04)(2020) 30-35.

[3] Zhang Hao. Cross-platform research and practice of C # language [J]. Computer knowledge and Technology, 2019jue 15 (13) 109-112.

[4] Han Kun, Huang Zefan. Fall behavior recognition method based on human posture dynamic characteristics [J]. Journal of Hunan University (Natural Science Edition), 47 (12)(2020) 69-76.

[5] Chen Zhangshao, Bi Sheng, Dong Min, Fang Zhenglin, Lang Tieshan. Human motion recognition system based on deep learning [J]. Application of single Chip Microcomputer and embedded system, (12)(2020) 10-14.

[6] Li Ji, Zhou Xuanhong, he Yong, Liu Xin, Chen Zewei. Target detection algorithm based on scale invariance and feature fusion [J]. Journal of Nanjing University (Natural Science), 2021 minute 57 (02) 237-244.

[7] Wang Yang. Summary of image matching methods [J]. Computer and Telecommunications, 2009 (05) 84-86.

[8] Yu Yang, Xiao Yang, Ren Fangyu, Zang Yuzhe, Liu Haijun. Summary of methods of feature image extraction and registration based on Opencv and remote sensing [J]. Science and Technology Innovation Bulletin, 2018 Magi 15(10)(2018) 48-49.

[9] Shen Gang, Yuan Pengtai. Application of attitude estimation algorithm in Video Surveillance [J]. Computer Age, (12)(2020) 33-37.