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Research of motion tracking and testing based on improved surendra algorithm

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ABSTRACT

Recently, due to the gradual mature of the development of computer vision, video-based monitoring and control system has become a classic practice in the field of computer vision. Traffic detection and tracking technology in intelligent video surveillance system is one of the branches of computer vision, which has gradually become a hot and new research field. Through analysis and summary of the existing detection and tracking technology, this study draws a set of target detection and tracking program at the perspective of taking photos with a single fixed camera on the road. The target in the program is the vehicle on the road. The key point of the program is to detect the target, and another is tracking. The main purpose of this study is to detect and track the moving vehicles on the road in the condition of a single fixed camera. This detection program uses the improved surendra algorithm, which is a more advanced algorithm in the algorithms of moving target detection. In all the algorithms, such as background subtraction method and the adjacent frame difference method, the improved surendra algorithm is more excellent than them. The algorithm is based on the mixed Gaussian model method and the improved adjacent frame difference. Experiment shows that the algorithm is able to track and detect the target vehicle accurately indeed. And the complexity, real-time and robustness of the algorithm are very consistent with the system design requirements of the study, so the adoption of the algorithm and the implementation of the detection system design of this study can track and detect the target vehicle well.

KEYWORDS

Computer vision field; Intelligent surveillance system; Tracking of target; Detection of target.



INTRODUCTION

Because the existence of the restricting factors, such as the weaknesses of human being, false positives and false negatives, monitoring time, long response time, difficult data analysis, the development of video surveillance system is restricted in some certain^[1]. But after adding the text-based information retrieval method, it gets a better retrieval result. This study combines the advantages of retrieval method which are based on text and content. This can help the doctor to analyze and compare medical images comprehensively and accurately and the search results are more in line with the customer's visual experience. Since this study focuses on the retrieval methods with a variety of features, now only two features are selected (texture features and shape features) and ready to add underlying features in the future study and to detect the sensitive areas of doctors to reach a better medical image retrieval results. Because intelligent video surveillance involves many core technologies, such as computer vision, image processing, artificial intelligence, etc^[2], it has a great challenge.

In recent years, with the increasing complexity of urban transport, traffic management faces the enormous challenges. The development of intelligent video surveillance system solves these problems in a better extent. In order to solve the above problems, the solution proposed in this study relies on the platform of electronic map to improve the construction of tourism information service system and makes the system to organize travel information effectively to help visitors to choose the concerned information through getting tourist information^[3]. The travel information service system designed in this study should include tourists registration management, tourism route management, query electronic maps, travel services offering, related content of travel companies, system background maintenance and other functions. In traffic intelligent video surveillance, the detection and tracking of motion vehicles play a very important role and have the very good theoretical research value and practical value.

TARGET RECOGNITION

Depending on the differences of information, the target recognition can be divided into the recognition based on movement and recognition based on shape. The advantages and disadvantages of each method and related literature can be seen in TABLE 1. The non-functional requirements of vehicle information monitoring system includes the security, reliability, portability and scalability and maintainability of vehicles information monitoring system. Specific individual functions are described as below: security of the system: customers who have registered and audited in the system can access the system and the customers who are not registered can not obtain any service information of the tourist information service system; reliability of the system: the customers need to log the system legally so as to access tourist information system accurately; portability and scalability of the system: when the new customers emerge, based on the original function, the function extensions of the system can be carried out without effect on existing function; maintainability of the system: It ensures to solve the fault occurred in the system within 24 hours and it also can identify pedestrians by analyzing the periodicity of two legs^[4].

TABLE 1 : Methods for pedestrian recognition

	The method based on sports	The method based on shapes		
		The method based on clear human body model	The method based on module matching	The method based on statistical classification
Principle	To identify the pedestrians by analyzing the periodicity gait	To build the explicit human parameter model to represent pedestrians With a clear model, easy to deal with posture and occlude problem	To represent pedestrians by template	To identify the pedestrians by classifier
Advantage	Less affected by color and light, more robust		The calculation method is simple	Do not need to set the big parameter manually, more robust
Disadvantage	Only identify the movement of pedestrians, need more frames, effect the real-time	Modeling and solving are complex	Need many templates to treat posture problems, Matching need more time	Need a large amount of training data
Typical literature	[18,23~25]	[10,19,26~28]	[1,3,29~31]	NN[6,32~34],SVM [7~9,36~39],Adabocst [4,40,42]

The system designed in this study is based on B / S mode and the surendra algorithm is provided by the Web browser. Platform surendra algorithm has four-layer structure, namely: external interaction layer, integrated processing layer, business layer, and information storage layer. Renters login the system by using the external interaction layer through the

browser; integrated processing layer can handle a variety requests of users flexibly, making the system more flexible; where the main functions of the business layer are the business security services, interface-friendly, information services configuration; generally, the information storage layer is designed by the forms of shared database and separated data to improve the security of the database. In order to make the interface and function of the system can be configured, as well as the education resources can be dispatched efficiently and flexibly, this platform system designs the scheduling mechanism for the requests and such requests need to change the business service status^[5]. For example, if a user submits a request to study the video, this operation will start the workflow management module and the platform will allocate system resources to maintain the life cycle of this video. The surendra algorithm can deal with various requests successfully and arrange the application services to support them schedule resources better by using workflow engine and rules engine. Thus, it can improve the detection effect and enhance the detection accuracy. The flow chart of adjacent frame difference based on the edge information is shown in Figure 1

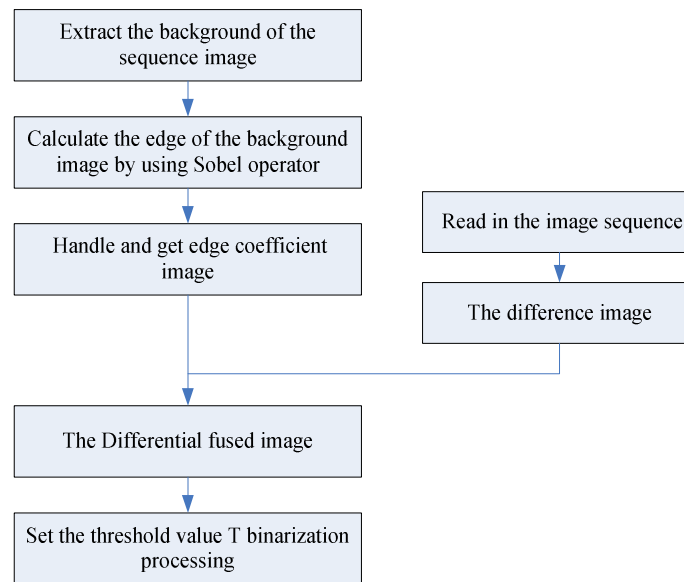


Figure 1 : The flow chart of adjacent frame difference based on the edge information

The methods based on clear human body model are carried out by the knowledge of body structure. As mentioned in the previous section, the core modules of distance education are divided into several submodules, such as consolidated supervision, authority control, business processes, system automatically sign, document processing, information collection, search, etc.. The system module is shown in Figure. Each module has the one to one correspondence relationship with the renter and each module is started by the corresponding renter identifier. The identifier uses the tunnel of metadata to the individual modules and each module combines metadata Ribbon to access the necessary resources. The main function of the comprehensive monitoring system is to install the platform system for surendra algorithm services and configure system parameters for users to assign users' rights. Authority control module has three ways to identify renters: the related people about surendra algorithm services and application; based on their identity identifier; to access the specified files through the appropriate rights assigned by the system. In order to provide the better, efficient and convenient services for different users, surendra algorithm should satisfy the needs of a variety of workflows. The configuration tool of workflow module only supports the workflow in department or the internal o platform system and it does not support the others. The system automatically sign module is realized by the ways of signature technology and watermark identification. The main function of file processing module is to increase, decrease and transfer the documents on the server. These documents are stored in a table in the database. And among the different renters, they are mutually independent. It also can manage some electronic files automatically, for example, to clean up the expired or temporary files, activate the relevant documents. The main function of the search module is to collect and extract the relevant information in the files to make users to enjoy a better access service^[6]. Using this function, students can search for the relevant information they need in the database of network security management system. And Yasuno divides human body into head and torso two parts.

Compared to the 2D model, 3D model has advantages in dealing with posture, network security management system. Usually, there are three kinds in data isolation methods. The first is database isolation, which is to keep the database independence between the users and an account corresponds to a database. This isolation scheme is the most thorough one and the data security is the highest, but the only drawback of it is that the investment is too high. The second is the data pattern isolation and shared database. The entire education platform only has one database and each account has an independent mode. It provides abstract logical data isolation for each user and it is not the actual physical isolation; and a database can support several users, which effectively reduces the system cost. due to the logical relationships of abstract isolation is complex, so it is difficult to manage. The second is the data pattern isolation and shared database. The entire

education platform only has one database and one data mode. It pluses the identifier (user ID) in the business table which has the isolation demand to achieve the purpose of isolating the data. This makes the sharing degree of the database become the highest and the system cost become lowest. But the isolation degree is not thorough enough. The disadvantage is that it increases the burden of the system developer and the amount of code of developers will increase in the aspects of safety and reliability as well as the data on the platform is also easy to lose^[7]. Considering the cost and safety of system, the cost of the second isolation scheme used in this data isolation of the study is low and the safety also meets the requirements. It is more in line with the requirements of distance education of China. The method is used in the AGO smart car developed by the Parma University in Italy.

Considering the database management system has its own set of data security access mechanism, most sensitive data protection measures only encrypt the identity of the system user and less of them encrypt the data in the system. Because the database management right of the distance education system is in the hands of the system operator, it is necessary to encrypt some private data to avoid the illegal openness and wrongful appropriation. The study researches a new cloud storage method and the surendra algorithm application to protect the security of data. In the system development process, the user data was separated out from the system. After the operation of the system platform, if the user's data and the data storage location can update at the same time, which is a new data store to a new location, it can protect the private data. When the system creating and running the database, usually, it would encrypt the database in accordance with the conventional encryption methods. And sometimes, it would do some small changes to the original system function to make the system can update of data storage locations. The data running on the old server of system operator B can be transmitted to the new server B through the Internet, which is equivalent to download the original server's resources to the mobile hard disk of someone. The users have the rights to transfer all the the database in the files to whatever they want^[8]. After the transfer of the data, the original database server will lose the access right to the private data. Surendra algorithm is in the background which is known, and it is a useful detection algorithm. The flowchart of background subtraction is shown in Figure 2:

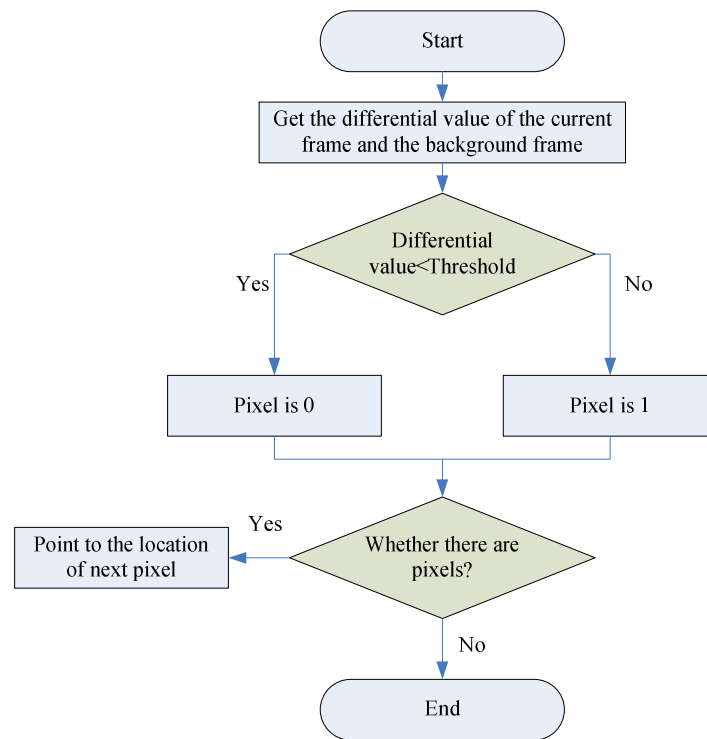


Figure 2 : The flowchart of background subtraction

Because the edge and where near the edge are easy to appear noise points, so the edge coefficient image can be get through the formula 1 processing to the edge image, then the formula of coefficient image in (x, y) is shown in formula 1:

$$\begin{aligned}
 F(x, y) = & I(x+2, y-2) + I(x-2, y-2) + I(x+2, y+2) + \\
 & I(x-2, y-2) + 2I(x+2, y-1) + I(x-2, y-1) + 2I(x-2, y+1) \\
 & + 2I(x+1, y-2) + 2I(x-2, y+2) + 2I(x-1, y-2) + \\
 & 2I(x+2, y+1) + 2I(x+1, y+2) + 3I(x+2, y) + 3I(x-2, y) + \\
 & 3I(x, y-2) + 3I(x, y-2) + 3I(x, y+2) + 3I(x-1, y+1) + \\
 & 3I(x-1, y-1) + 3I(x+1, y+1) + 3I(x+1, y-1)
 \end{aligned}
 \tag{1}$$

The template coefficient matrix is shown in Figure 3:

1	2	3	2	1
2	3	0	3	2
3	0	0	0	3
2	3	0	3	2
1	2	3	2	1

Figure 3 : Coefficient matrix

EXISTING SYSTEMS AND PERFORMANCE

Evaluation methods

The most difficult problem of pedestrian detection based on computer vision is to evaluate the performance of different algorithms. The system users upload their own information through the registration on the login and they can use the learning on the platform after landing the system. According to the requirements of users, the platform provides the information to them which is obtained from the corresponding server. The users should login the screen and register information and after the information is submitted, the “community” will manage the submitted information. “Community” has all the resources on the platform. In essence, the “community” is a classification of users’ needs. It abstracts the users who have the or similar requirements into the households in a “community” and provides the manager for them. In “community”, the platform users need to comply with the community management system and use the community resources (namely learning resources on the platform) according to a certain process. According to the behavior of the users in the “community”, the managers understand the specific needs to recommend the related resources for users. In the cloud computing service module, all the teaching resources are stored on cloud servers. The powerful cloud computing capabilities of cloud computing can easily meet the needs of a large number of users to access the system frequently; cloud services model also can reduce the investments in bandwidth, firewall, load balancing equipment for users; and it will help the users to solve network security problems, complex calculation problems, data integrity problems. The cloud computing uses the XML technology to exchange the data in the underlying. The system has a teacher-student interaction function and teachers can answer students’ questions directly on the education platform. System management module can control all of the resources on the platform, including the monitoring to each module of the system itself and regulation to the movement behavior of the teachers and students on the platform. All the resources and operations on the platform is transparent for the module. But the disadvantage is that due to the subjectivity of manual annotation and different threshold of judging correct test results, it is difficult to compare the advantages and disadvantages of each system.

TABLE 2 : The experimental results of typical pedestrian detection system

Author	BOIs Segmentation	Target recognition	The experimental results
Broggi ^[2]	Take advantage of camera parameters and the symmetry of the known edge	Take advantage of template matching of head	Only give a few pictures as examples, no detailed test results
Gavrila ^[29]	No	Layered template matching	The evaluation method for based on the detection: do the test with 900 unobstructed pictures, the correct detection rate is 45% -75%, the false alarm rate is unknown
Zhao ^[6]	Stereo vision	Take advantage of the neural network classifier of gradient image	The evaluation method based on the detection: use 8400 windows for evaluation, the accuracy is 85.2%, the false alarm rate is 3.1%
Shashua ^[4]	Take advantage of texture features	The Adaboost classifier based on SIFT	The detection rate for the movement of pedestrians in the road is 96%, with only a false alarm in five hours of driving process
Oren ^[7]	No	SVM based on Haar feature	The evaluation method based on classification: the detection rate 69.6%, false alarm rate is 1: 15000
Mohan ^[8]	No	SVM based on Haar feature, divide the pedestrian into blocks	The evaluation method based on classification: the detection rate 90%, false alarm rate is 1: 10000

The evaluation method mentioned above only evaluate from the perspective of pattern recognition. Each account has an independent mode. It provides abstract logical data isolation for each user and it is not the actual physical isolation; and a database can support several users, which effectively reduces the system cost. due to the logical relationships of abstract isolation is complex, so it is difficult to manage. The second is the data pattern isolation and shared database. The entire education platform only has one database and one data mode. It pluses the identifier (user ID) in the business table which has the isolation demand to achieve the purpose of isolating the data. This makes the sharing degree of the database become the highest and the system cost become lowest. But the isolation degree is not thorough enough. The disadvantage is that it increases the burden of the system developer and the amount of code of developers will increase in the aspects of safety and reliability as well as the data on the platform is also easy to lose. It has a try for the establishment of a system-level testing evaluation approach.

Performance of the typical system

Although there are a lot of literature about pedestrian detection, less give a detailed experimental results. The main function of the comprehensive monitoring system is to install the platform system for surendra algorithm services and configure system parameters for users to assign users' rights. Authority control module has three ways to identify renters: the related people about surendra algorithm services and application; based on their identity identifier; to access the specified files through the appropriate rights assigned by the system. In order to provide the better, efficient and convenient services for different users, surendra algorithm should satisfy the needs of a variety of workflows. The configuration tool of workflow module only supports the workflow in department or the internal o platform system and it does not support the others. The system automatically sign module is realized by the ways of signature technology and watermark identification. The main function of file processing module is to increase, decrease and transfer the documents on the server. These documents are stored in a table in the database. And among the different renters, they are mutually independent. It also can manage some electronic files automatically, for example, to clean up the expired or temporary files, activate the relevant documents. The main function of the search module is to collect and extract the relevant information in the files to make users to enjoy a better access service. For example, the system based on neural network of Zhao^[9] and the system based on Adaboost of Shashua^[10].

CONCLUSIONS

The main purpose of this study is to detect and track the moving vehicles on the road in the condition of a single fixed camera. This detection program uses the improved surendra algorithm, which is a more advanced algorithm in the algorithms of moving target detection. In all the algorithms, such as background subtraction method and the adjacent frame difference method, the improved surendra algorithm is more excellent than them. the algorithm is based on the mixed Gaussian model method and the improved adjacent frame difference. Experiment shows that the algorithm is able to track and detect the target vehicle accurately indeed.

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