

Research on Motion Body Detection and Abnormal Behavior Recognition Based on WiFi Technology

Wu Fei

School of Software and Applied Science and Technology, Zhengzhou University, 450000

Keywords: WiFi technology, sports human detection, abnormal behavior recognition technology

Abstract: In recent years, sports human behavior analysis has attracted more and more attention of computer vision researchers. Therefore, based on WiFi technology, the author carries out research on human motion detection and abnormal behavior recognition technology. Research shows that it is one of the most attractive research fields in computer vision. The core of its research is to detect, track and identify moving human body from video sequences and to understand and describe the behavior of moving human body. This effectively reduces the cost of manpower and material resources, while reducing the amount of computation, realizing the real-time active early warning function, and solving the after-effects of the traditional video surveillance system.

1. Introduction

In recent years, with the development of computer vision and image processing technology, due to its wide application prospects, the analysis of sports human behavior has attracted wide attention [1]. Sports human behavior analysis is an interdisciplinary research topic, the main research content involves computer vision, image processing, pattern recognition, artificial intelligence, computer graphics and other multidisciplinary fields [2]. Automatically filtering out the invalid information in the video can not only improve the real-time recognition of the human body behavior of the video system, but also can accurately identify the behavior [3]. In short, not only replace the human eye with a camera, but also use computers to replace people and assist people to complete monitoring or control tasks, thus reducing the burden on people [4]. In order to prevent and prevent the occurrence of criminal acts in time and protect the safety of citizens' personal and property, video surveillance system, which is typically represented by cameras, has been widely spread in all areas of people's lives [5]. The purpose of moving human body detection is to extract the moving human body from the background accurately. It is the basis of human behavior recognition and analysis. Motion human behavior analysis is an interdisciplinary research topic. The main research contents include computer vision, image processing, pattern recognition, artificial intelligence, computer graphics and other multidisciplinary fields [6]. This can effectively reduce the cost of human and material resources, reduce the amount of calculation, achieve real-time active early warning function, and solve the aftermath of traditional video surveillance system.

Video surveillance system, as an indispensable technical means of security, plays an extremely important role in various fields such as security protection, and applies to all aspects of life. This not only saves a lot of manpower, material and financial resources, but also discovers the situation in time to avoid the occurrence of crime [7]. For example, remote video surveillance system can be seen everywhere in every important place of financial industry which grasps the lifeline of national economy; military base security and border and coastal defense line surveillance in military field. Archives, Museum monitoring and so on in important national security departments. Existing motion detection algorithms for image sequences usually adopt different methods because of their different application ranges [8]. There are three methods for moving target detection methods: frame difference method, background subtraction method, and optical flow method. Visual surveillance has broad application prospects and potential economic value. However, the traditional video surveillance system has a single function, and can only mechanically record the entire event occurrence process, and does not have the function of actively discriminating human behavior. If an

abnormal situation occurs, it can only be investigated and evidenced by post-video playback [9]]. In recent years, it has attracted the attention of research institutions and scholars at home and abroad. In the identification of abnormal behaviors of the moving human body, this paper mainly carried out the following research work [10]. The shadow detection method based on the shadow attribute detects the shadow according to the geometric feature, the color feature or the brightness feature of the shadow region, and has wider applicability.

2. Motion detection

The purpose of motion detection is to extract moving human body regions from complex backgrounds in a video sequence. Since 2012, domestic well-known e-commerce companies such as ZTE, Huawei, and Xiaomi have been actively involved in the research and development of smart cameras. More and more video surveillance systems are in use, and monitoring equipment is becoming more and more advanced. The intelligent robot is the most ideal form. It can simulate human functions, can sense the external world and can respond to data analysis. If you want to deal with sudden and abnormal events in a timely manner, you must ask the staff to monitor the activities in the scene day and night without interruption. The workload is heavy. It is not only a serious waste of human resources due to the need for a large number of staff, but also easy to cause the monitoring staff to be mentally lax due to sensory fatigue, leading to alarm omission. The frame difference method is to extract the moving region by using pixel-based difference and thresholding between two or three adjacent frames in a continuous image sequence. The advantage of frame difference method in target detection is that it can reflect the real-time change of background in video image, but the detection result is easy to produce "duplication" or "holes". Background subtraction is a widely used method in moving object segmentation, especially when the background is relatively static. It uses the current frame and background frame to differentiate and thresholding to detect moving objects. It can get comprehensive feature data of moving objects, but it is very sensitive to dynamic scene changes due to light and other irrelevant events.

Through the analysis of the above three methods, we can see that background subtraction, optical flow and frame difference methods have their own advantages and disadvantages in moving target detection. This paper presents their advantages and disadvantages in the form of tables, as shown in Table 1.

Table 1 Comparison of advantages and disadvantages of three methods

Motion Target Detection Algorithms	Advantage	Shortcoming
Background subtraction	Moderate computational complexity and adaptability to slow change and slight disturbance of background light	It is not suitable in the case of video camera movement. It is very sensitive to the change of light, and the process of setting up and updating background model is complex.
Optical flow	It can be applied in static and dynamic background. It can detect moving objects without knowing any prior knowledge.	The algorithm is complex, computational complexity is large, real-time performance is poor, and it is sensitive to noise and illumination changes.
Frame difference method	The algorithm is simple, real-time, not particularly sensitive to light and shade changes, and has strong adaptability to the environment.	It can only be applied to the static situation of the camera and can not accurately extract the complete contour of the moving object.

Time difference method is a method of extracting the foreground region of an image by using pixel-based time difference and Language between two or three adjacent frames in a continuous image sequence. The optical flow method uses the optical flow characteristics of moving objects varying with time. The advantage of this method is that independent moving objects can be detected in the presence of camera motion. However, in fact, few people watch these videos, most of which are only used to obtain evidence for some safety incidents after the event. This is not only a waste of resources, but also to some extent condoned the occurrence of some safety incidents. Therefore, it is extremely important to give intelligent robots intelligence for the development of intelligent robots, and it is one of the most human challenges in human scientific research. In addition, it is very difficult to obtain useful information from massive video surveillance data, which brings considerable difficulty to the relevant agencies to detect abnormal events, and does not achieve the real purpose of real-time monitoring. Therefore, there is an urgent need for an intelligent video surveillance system that can replace the human eye to complete surveillance tasks. The background subtraction method is to detect the motion area by differentiating the current frame from the reference background image. Background subtraction can detect a relatively complete moving target area, but an appropriate background update method needs to be established. However, most optical flow calculation methods are quite complex and have poor anti-noise performance, and cannot be applied to real-time processing of full-frame video streams without special hardware devices.

After the experimental training, the relationship between the number of segments of the two experimenters and the average recognition time can be seen from Fig. 1. The specific data is shown in Fig. 1.

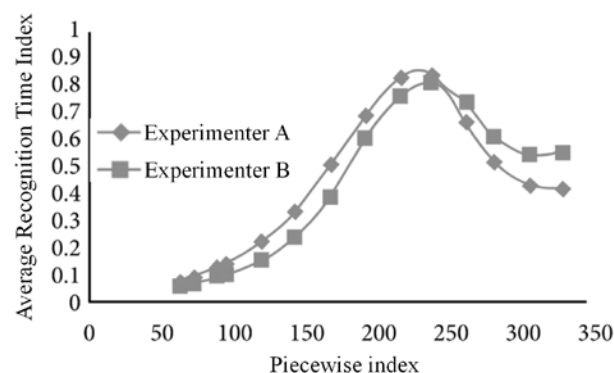


Figure 1 Number of segments and average recognition time of two experimenters

3. Behavioral understanding and description

Human behavior recognition and understanding refers to the analysis and recognition of human behavior patterns, and is described by natural language. Feature extraction and motion description are the extraction of suitable feature data from human motion sequences to describe the motion state of human beings. It is a key issue in human behavior recognition. The quality of selected features will directly affect the recognition effect. However, to date, no system has actually captured or restored the body's motion information and three-dimensional structure from video sequences. To evaluate whether a detection algorithm is excellent, generally the following three aspects are mainly evaluated: the quality of detection, that is, the accuracy of detection. At present, human behavior description is limited to simple semantic interpretation. For example, Bemagnino et al. proposed a visual surveillance system based on video object behavior, which provides a textual description of object dynamic activities in three-dimensional scenes. Generality, that is to say, the link of reducing the probability of manual operation as far as possible in the process of detection; the amount of calculation, that is, the requirements of hardware and software can not be too high, and can be processed quickly in real time. Human body is a non-rigid body, and its structure is complex. There are serious occlusion phenomena in motion. Moving object tracking is an important research topic in the fields of computer vision, image processing and pattern recognition. It is also the basis of

high-level behavior understanding such as behavior analysis.

The semantics description of human behavior is to analyze and recognize the motion pattern of the moving human body through continuous tracking observation, to judge whether the behavior belongs to abnormal behavior, and to describe it by natural language. According to the difference of template matching methods, tracking methods can be divided into four categories: region-based tracking, feature-based tracking, model-based tracking and active contour-based tracking. The appearance of human body is very different because of the different colours and patterns of clothing, so it is difficult to express it with a unified model. It extracts the background image of the image by utilizing the difference features between the moving and relatively static scenes in the video image, and completely distinguishes the moving object from the background image by using the difference features. Although the technology of human motion analysis has been greatly developed, it is influenced by the non-rigidity of human motion, the high degree of freedom, the scene of human motion and the ambiguity, occlusion, shadow and other factors of human motion. It makes the analysis of human motion behavior still in the primary stage of simple behavior and event detection. Current studies are mostly focused on simple standard actions, simple behaviors, events and contexts. Therefore, only by improving the effectiveness and robustness of the algorithm can we really apply the human motion analysis technology to the complex real environment.

4. Conclusion

Motion human behavior analysis involves many disciplines such as artificial intelligence, pattern recognition, computer vision and so on. Because of its wide application prospects in intelligent monitoring, motion analysis, perception interface, virtual reality and so on, it is attracting more and more researchers' attention. In order to overcome the shortcomings of traditional single method which has more interference and incomplete contour, a moving object detection method based on improved GMM background modeling is proposed. At present, all the video we input can get satisfactory behavior detection results, which proves that some new algorithms we mentioned in the research process have achieved certain results. However, if the actual complex application is actually used, there are still many problems to be solved in the system. The characteristic changes of the human body when the fall behavior is analyzed. The aspect ratio of the target external rectangular frame and the deviation degree of the human body's centroid are used to realize the human body's fall behavior recognition. The experimental results show that the algorithm can accurately detect the human fall behavior. In the case of shadow detection, shadow detection and removal are performed only on areas that may be moving targets or shadows detected by the mixed Gaussian model. This not only ensures the accuracy of shadow detection, but also improves the real-time performance of the algorithm. With the development of computer vision and other related knowledge, behavior analysis will also rise from simple behavioral recognition and semantic understanding to higher-level behavioral analysis and natural language description in complex contexts.

References

- [1] Lee J, Kim S, Lee J, et al. A stretchable strain sensor based on a metal nanoparticle thin film for human motion detection. (2014) *Nanoscale*, 6(20), 11932-11939.
- [2] Liangyi G, Wu Y, Dapeng M, et al. WiFi-Based Real-Time Calibration-Free Passive Human Motion Detection. (2015) *Sensors*, 15(12), 32213-32229.
- [3] Maurer J P, Heinrich T S, Bach M. Direction tuning of human motion detection determined from a population model. (2014) *European Journal of Neuroscience*, 19(12), 3359-3364.
- [4] Gupta M, Behera L, Subramanian V K, et al. A Robust Visual Human Detection Approach With UKF-Based Motion Tracking for a Mobile Robot. (2015) *IEEE Systems Journal*, 9(4), 1363-1375.
- [5] Kanaparthi S, Sekhar V R, Badhulika S. Flexible, eco-friendly and highly sensitive paper

antenna based electromechanical sensor for wireless human motion detection and structural health monitoring. (2016) *Extreme Mechanics Letters*, 9, 324-330.

[6] Darwishalzughaibi A, Ahmed Hakami H, Chaczko Z. Review of Human Motion Detection based on Background Subtraction Techniques. (2015) *International Journal of Computer Applications*, 122(7213), 1-5.

[7] Politi O, Mporas I, Megalooikonomou V. Comparative Evaluation of Feature Extraction Methods for Human Motion Detection. (2016) *Ifip Advances in Information & Communication Technology*, 437, 146-154.

[8] Shuaishuai Z, Sheng W, Yunpeng W, et al. Conductive shear thickening gel/polyurethane sponge: A flexible human motion detection sensor with excellent safeguarding performance. (2018) *Composites Part A: Applied Science and Manufacturing*, 2112, 197-206.

[9] Ryu J, Lee B H, Kim D H. sEMG Signal-based Lower-limb Human Motion Detection Using Top and Slope Feature Extraction Algorithm. (2016) *IEEE Signal Processing Letters*, 1-1.

[10] Wang Y, Zheng Y. An FMCW Radar Transceiver Chip for Object Positioning and Human Limb Motion Detection. (2017) *IEEE Sensors Journal*, 99, 1-1.