International Journal of Engineering & Technology, 7 (2.33) (2018) 1138-1140

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Moving Objects Detection System on Spherical Panorama

Hong-gue Kang[1], Soon-Gohn Kim[2]*

[1]Joongbu University, Department of Broadcasting & Visual Art, 201 DAEHAK-RO, CHUBU-MYEON, GEUMSAN-GUN, CHUNGNAM, 312-702, South Korea

[2]Joongbu University, School of Software Engineering, 305 Dongheon-Ro, Deogyang-Gu, Goyang-Si, Gyeonggi-Do, 10279, South Korea

Corresponding author Email: sgkim@joongbu.ac.kr

Abstract

Background/Objectives: As a security camera system, there is an image security system that uses CCTV (Closed Circuit TeleVision). For supervisory imaging device for CCTV, cameras are used.

Methods/Statistical analysis: It was not possible to get valid level of result and not possible to detect minor changes since it is based on histogram. Therefore, this paper suggests spherical panorama image supervisory system with DoF(Difference of Frame) technique.

Findings: The error-detection ratio and execution time are very important things. So, we experimented the error-detection and execution time on the same one panorama 21 images per one meter. The first performance index represent the execution time of each frame and second index represent the number of total frame and error detected frame on the each locations.

Improvements/Applications: For supervisory imaging device for CCTV, cameras are used. There is method to install number of cameras to minimize blind spot. However, installation cost, using power, maintenance time and cost are dramatically increased due to increasing number of cameras.

Keywords: *CCTV, Spherical Panorama, Moving Object Detection, DoF Algorithm, Image Processing.*

1. Introduction

Security camera system is a system that prevents non-expected situation and conduct visual security actions through behaviors such as detecting non-expected movement and behavior, as well as non-wanted items or tracking certain target. As a security camera system, there is an image security system that uses CCTV(Closed Circuit Television). For supervisory imaging device for CCTV, cameras are used. It is possible to classify cameras for security camera system. First is a general type of camera that observe certain location by fixed into a position as fixed camera. Second is a dome type camera which is called as PTZ(Pan, Tilt and Zoom) camera. The position of PTZ camera is fixed, but it can change recording direction. Also, it can zoom in and out freely. For the second classification of camera is usually called as 'rotary type camera'. The last classification is tracking robot camera. Cameras are attached on small robot or portable drone that has been spotlighted recently and observe certain target by tracking them. However, those three classified observation cameras have the common problem which is having blind spot of detection. This is critical problem for the system.

To solve this, there is a method to install number of cameras to minimize blind spot. However, installation cost, using power, maintenance time and cost are dramatically increased due to increasing number of cameras. Therefore, it is not possible to be called as the best solution. There is number software such as Video Card that are developed to install number of supervisory cameras efficiently. However, this is the only a tool to find an arrangement of cameras that can minimize blind spot. It does not decrease the number of cameras.

The remaining parts of the paper are organized as follows, In Section 2, we discuss the related technology for the moving objects detection system for spherical panorama. In Section 3, we propose the detection system model for our research works. And last, Section4, 5 concludes this paper.

2. Related works

This problem can face problem that are caused by hiding from walls or different objects which was suggested from articles by Guler and others[1]. To overcome this problem, Onoe[2] and others composed Hemispherical Panorama lens that is called as Hyper Omni vision and suggested all direction supervisory by using hemispherical panorama image. However, this method has limitation of directional property and arrangement of lens shows a problem such as having 90 degree for top-bottom viewing angle (hereinafter VFOV) even though left-right viewing angle (hereinafter HFoV) goes up to 360 degree. Hemispherical panorama image is hard to understand by normal people. It is hard to find and detect minor change by eyes. For alternatives, spherical cameras can detect all directions effectively compare with existing methods since it can supervisor in all directions. Detecting change is the most basic for image supervisory system. However, small change of light source changes resolution difference for constant space. Stauffer and other[3] used Gaussian Mixture Model to be success on corresponding against small change of light source by training background image model, but it was not possible to correspond on rapid light source change. Noriega and others[4] used histogram of sectional kernel to solve above problem and it was possible to improve performance by suggesting background training methods against rapid change of

light source. However, it was not possible to get valid level of result and not possible to detect minor changes since it is based on histogram. Therefore, this paper suggests spherical panorama image supervisory system with DoF(Difference of Frame) technique.

3. Proposed Work

In this paper, we firstly designed and implemented the menu-driven panorama viewer which translate 360 panorama images to plain views as follows(Figure 1).

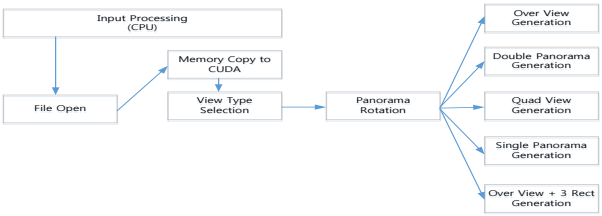

Figure 1:. Design of 360 panorama image processing sequence and view types

As following figure 2

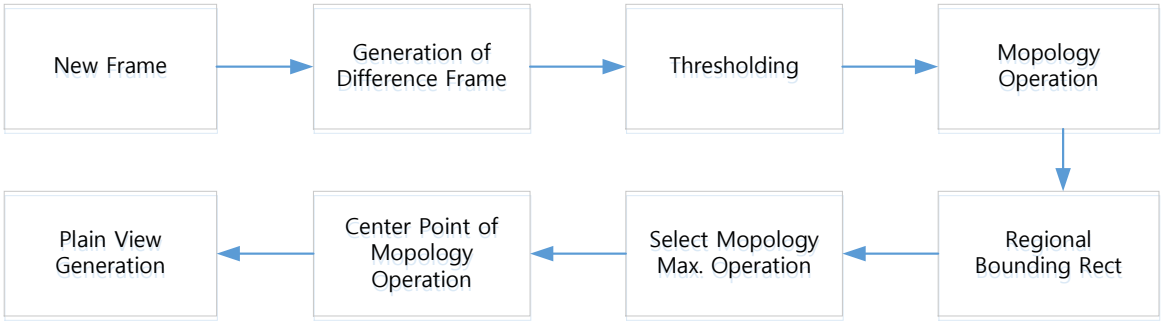

Figure 2:. The moving object monitoring system flow

As the suggested method, spherical panorama image of width and length ratio 2:1 is inputted at the first. Then, it gets 1 frame of the same screen from repetition. When a frame is achieved, difference image is achieved by getting absolute value after conduction difference calculation from frame image that are achieved from repetition. For each brightness value of difference image, binary images are achieved by conducting thresholding based on user inputted value. Then, all closed changed images are combined into one by conducting open morphology calculation. After that, several Bounding Rect that surrounds each area are achieved. The biggest Bounding Rect from several achieved Bounding Rect can count occurred behavior in the closest distance. Therefore, the center point of the Bouncing Rect should be achieved. Covert the center point of the Bounding Rect into geographical coordinate and get new view by reflecting images of corresponding bounding Rect from spherical contact. When new achieved plane view and spherical panorama image, hemispherical panorama view are displayed at the same time, it is possible to build a movement supervisory system that can be understood by people who are not familiar with spherical panorama image. Also, it can be the basement of using high level detection technology by applying existing image process technology through achieved plane view. The Bounding Rect operation results and due to the suggestion method, it is appropriate to set plane view which displaces movement detection and 360 over view as half size of the spherical panorama image and put those two images under the spherical image. Also, displaying converted panorama screen for the case of 360 over view, it is possible to display panorama image that can be easily understood by users.

In this works, the error-detection ratio and execution time are very important things. So, we experimented the error-detection and execution time on the same one panorama 21 images per one meter. The first performance index represent the execution time of each frame and second index represent the number of total frame and error detected frame on the each locations. As following figure 3 shows the initial frame of the 360 degree spherical panorama which used in experimental works and we experimented the moving object monitoring more than 100 times

Figure 3:. 360 panorama initial frame

In this experimental works, we designed the system that got the plain views of the specific regional areas if the moving object detected. The following figure 4 shows the generation time for the plain view after moving detection recognition. We verified the execution time, average 0.000000292652 time/sec per each frame, and detected the moving object recognition on 7 meter from original position. On the graph, On the graph, the sharp error-detection spots means the result of waiting which had at least moving situations and the performances were decreased for the long distances moving images.

The Recognition of the frame on the images surveillancesystem is the basic technique. But, if the source of light minutely changes might the resolution differences are extremely changed on the digital image system. Stauffe et al. suggested the background image model training system through the Gaussian hybrid model and success on cope with minute ly changes of the source of light. But, this approach could not cope with a rapid changes. Noriega et al. suggested the background training technique to cope minutely changes of the source of light to resolve it using the local histogram. But, this approach had not reliable level of the results and could not recognize the minutely changes based on the histogram.

In this paper, we implemented the moving object monitoring system based on the DoF(Difference of Frame)

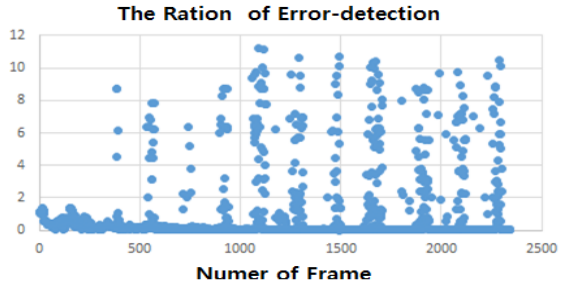

Figure 4:. The moving object monitoring system flow

4. Conclusion

As a security camera system, there is an image security system that uses CCTV(Closed Circuit Television). For supervisory imaging device for CCTV, cameras are used. There is a method to install number of cameras to minimize blind spot. However, installation cost, using power, maintenance time and cost are dramatically increased due to increasing number of cameras. This paper suggests spherical panorama image supervisory system with DoF(Difference of Frame) technique and shows the experimental results. Now, we are plan to research related to motion detection and recognition of walker on the spherical panorama.

Acknowlegment

This paper was supported by Joongbu University Research & Development Fund, in 2018.

References

[1] Guler, S., Griffith, J. M., &Pushee, I. A.,Tracking and handoff between multiple perspective camera views. In Applied Imagery Pattern Recognition Workshop, 2003. Proceedings. 32nd, pp. 275-281.

[2] Onoe Y., Yokoya N., Yamazawa K., &Takemur H.,Visual surveillance and monitoring system using an omnidirectional video camera.in Pattern Recognition, 1998. Proceedings,1998 August, pp. 588-592.

[3] C. Stauffer and W.E.L. Grimson, Adaptive ackground mixture models for real-time tracking. Proc. IEEE CVPR. 1999 June, pp. 248-252.

[4] Noriega P., Bernier O.,Real Time Illumination Invariant Background Subtraction Using Local Kernel Histograms. In BMVC. 2006 September, Vol. 6, pp. 979-988.