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An AMD Algorithm For Monitoring Suspicious Human Activity In Real-Time Automated Video Surveillance System

[1]Madhu S (M.Tech), [2] Prof. Padma Nayana

[1] SIT, Mangalore, [2] Dept. of Computer Science SIT, Mangalore, India

Abstract**:** *Video Monitoring has long been in use to monitor indoor security sensitive areas such as Banks, Departmental Stores, Shopping mall, office and house. This paper presents a frame work that allows the real-time detection of human in a video stream acquired by a static camera. For each stage of the processing chain, which takes as input the raw images of the stream and eventually outputs the identity of the persons. We propose an AMD algorithm to achieve complete motion detection of moving detection of moving objects by involving three significant modules background modeling(BM), an alarm trigger module (AT) and an object extraction (OE) these are well suited for modern surveillance system. It operates Real-time and has an efficient accuracy for detecting Suspicious Activity. Automating Suspicious activity detection will help decrease error rate.*

Keywords**: Automation, Detection, Surveillance, Suspicious activity, Tracking**

1. Introduction

Human quest for an automatic detection system of everyday occurrence lead to the necessity of inventing an intelligent surveillance system which will make lives easier as well as enable us to compete with tomorrows technology and on the other hand it pushes us to analyze the challenge of the automated video surveillance scenarios harder in view of the advanced artificial intelligence.

Nowadays, it is seen that surveillance cameras are already prevalent in commercial establishments, with camera output being recorded to tapes that are either rewritten periodically or stored in video archives. To extract the maximum benefit from this recorded digital data, detect any moving object from the scene is needed without engaging any human eye to monitor things all the time. Real-time segmentation of moving regions in image sequences is a fundamental step in many vision systems.

Video surveillance activities can be manual, semi-autonomous or fully-autonomous. Manual video surveillance involves analysis of the video content by a human. Such systems are currently widely used. Semi-autonomous video surveillance involves some form of video processing but with significant human intervention. Typical examples are systems that perform simple motion detection. Only in the presence of significant motion the video is recorded and sent for analysis by a human expert. By a fully-autonomous system, only input is the video sequence taken at the scene where surveillance is performed. In such a system there is no human intervention and the system does the low-level tasks, like motion detection and tracking, and also high-level decision making tasks like abnormal event detection and gesture recognition.

Video surveillance system that supports automated objects classification and object tracking. Monitoring of video for long duration by human operator is impractical and infeasible. Automatic motion detection which can provide better human attention. There are varieties of application in video surveillance like access control, person identification, and anomaly detection.

2. Human Motion Detection

Moving human detection is the first step processes for nearly every system of vision-based analysis. The aim of moving human detection is to segment the regions corresponding to people from the rest of an image sequence. It is known to be a significant and difficult research problem.

There are three conventional approaches to moving object detection : temporal differencing, optical flow and background estimation. Temporal differencing is very adaptive to dynamic environments, but generally does a poor job of extracting all relevant feature pixels. Optical flow can be used to detect independently moving targets in the presence of camera motion, however most optical flow computation methods are very complex and are inapplicable to real-time algorithms without specialized hardware. Background subtraction is a particularly popular method for motion segmentation especially under those situations with a relatively static background. It attempts to detect moving regions in an image by differencing between current image and reference background image in a pixel-by-pixel fashion. However, it is extremely sensitive to changes of dynamic scenes due to lighting and extraneous events. To overcome that problems a new statistical background model initialize and a maintenance of the background model approach is approached.

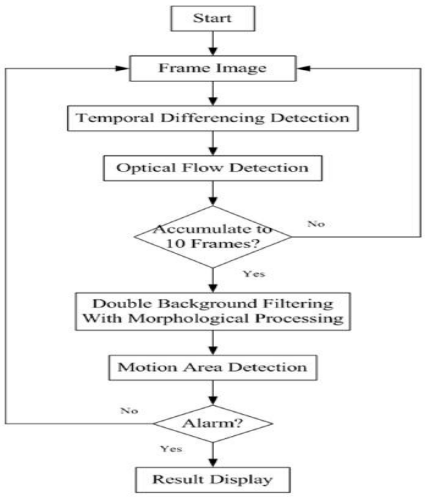

Fig 1: Flowchart of motion detection method

3. System Configuration

Mobile client: A cell phone running at user end, where all controlling activities of the application take place.
Server: A computer is connected with camera and Bluetooth enabled mobile.
JMF : A Java library that enables audio, video and other time based media to be added to java applications and applets. This optional package, which can capture , playback, stream and transcode multiple Media formats, extend platform , Standard Edition (Java SE)and allows development of cross platform multimedia application.
Alarm : Whenever motion is detected at the server side. The client can play alarm by using his/her mobile phones.

Features:
Acts as a security for restricted place.
Can monitor the specific place remotely.
Can update the security status remotely.
Can able to control the application using command.

Fig 2: overall Architectural diagram.

4. Algorithm

The major purpose of background subtraction is to generate a reliable background model and thus significantly improve the detection of moving objects. Our approach i.e Advanced Motion Detection achieves complete detection of moving objects and involves three proposed modules a background modeling(BM) module, an alarm triggering AT module, and an object extraction module(OE)module.

A. Background Modeling
The proposed BM module designs a unique two phase background matching procedure using rapid matching followed by accurate matching in order to produce optimum background pixels for the background model.

1) Initial Background Model:
The modified moving average(MMA) is used to compute the average of frames 1 through k for the initial background model generation.

2) Optimum Background Modeling(OBM):
The main objective of OBM is to extract the stable signal of the incoming frame in the video sequence.
We continuously check the pixels using following techniques

Rapid Matching : This procedure is used to quickly find a create quantity of background candidates by determining whether or not their respective pixel value for the incoming video frame It(x,y) are equal to the corresponding pixel values of the previous video frame It-1(x,y). if the values correspond, it indicates good candidate selection for the following stable signal trainer.

Stable Signal Trainer : All pixels from the set of background candidates selected via the rapid matching procedure are then trained through the stable signal trainer.

Accurate Matching: The optimum of these are then determined when the pixels of the corresponding pixel within the most recent set of background candidates are equal to incoming video frame.

3) Background Updating:
We continuously update background model so we get the best result.

B. Alarm Trigger Module
This module consists of a novel block-based entropy evaluation method developed for the employment of block candidates, after which the most likely moving objects within the motion blocks are determined based on block based morphological erosion and dilation operations.

C. OE Module:
The detection of moving objects can be achieved through the observed change in gray-level illumination of the obtained motion blocks within the absolute difference.

5. Result

This section will present the results of tracking experiments based on above mentioned algorithm and experimental setups. Initially, the system will detect suspicious person i.e unauthorized entry in a restricted place in a video by using AMD algorithm and will start tracking once the user has specified a suspicious person by his/her on the display.
In this paper measurements are made for different environments to find the strength of algorithm.
1) Simple background subtraction algorithm adaptation is faster in data validation than the modified algorithm but it gives worse results and low accuracy with high rate of false alarms.
2) In general, algorithms that adapt more slowly often have better performance than those that adapt quickly.
3) The AMD algorithm gives better performance values than the simple algorithm. this result to increased accuracy for the system by 60 to 70.

6. Conclusion

This paper has presented a novel module that generated an accurate background with production of neither noise pixels nor artificial "ghost" trails. After a high-quality background model was produced, the AT module eliminated the unnecessary examination of the entire background region and reduced the computational complexity for the subsequent motion detection phase. The proposed object extraction module detected the pixel of moving objects within the triggered alarm region to from the moving object mask. It also initiates the development of a system for suspicious human monitoring and study of their behaviors. Finally this algorithm works for On-line(Real-time) video processing and its computational complexity is low.

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