ISSN XXXX XXXX © 2017 IJESC

Research Article Volume 7 Issue No.5

An Approach for Denoising and Analysis of Surveillance Video for Security Applications

Ashwini R. Deoghare[1], Pritesh R. Gumble[2]
PG Student[1], Associate Professor[2]
Department of Electronics & Telecommunication
Sipna College of Engineering & Technology, Amravati, India

Abstract:
Nowadays because of increase in crime activities, higher demand and greater awareness on security problems lead to the study of more secure, high performance, reliable and flexible systems. To reduce such crime activities processing of videos involved in such activities will be necessary. It aims at the surveillance video of payee's abnormal behaviour based on the video denoising algorithm. In this work, we will be able to distinguish the normal and abnormal activities like money snatching, harm to the person by virtue of fight, or attack on the person. The proposed system will detect the unusual event which occurs in the security centre. By developing a system that will give an alarm when something abnormal is occurring it could eliminate the need for extra people to monitor surveillance feeds. It has growing demand for applications to support monitoring indoor and outdoor environments such as ATM center, shopping malls etc. The significant efforts in the field of tracking and moving object detection will have been done to make the security applications robust, reliable and efficient.

Keywords: Surveillance video, Denoising algorithm, unusual event detection, Moving object detection

I. INTRODUCTION

A fundamental challenge in intelligent video surveillance is to automatically detect abnormal events in long video streams. Video anomaly detection is also important as it is related to other interesting topics in computer vision, such as dominant behaviour detection, visual saliency and interestingness prediction.

A typical approach to tackle the anomaly detection task is to learn a model which describes normal activities in the video scene and then discovers unusual events by examining patterns which distinctly diverge from the model. However, the complexity of scenes and the deceptive nature of abnormal behaviours make anomaly detection still a very challenging task. Several anomaly detection approaches are based on analyzing individual moving objects in the scene.

Surveillance is carried out, e. g., to ensure public safety or for safety-oriented supervision of private environments where people may live alone. In fact, the increasing desire in public security over the past decades has motivated the installation of sensors such as cameras or microphones in public places (stores, subway, airports, etc.).

Thus, the need of unsupervised situation assessment stimulated the signal processing community to experiment with several according automated frameworks. Data-driven classification approaches, relying on a-priori classification of the data, were applied for a successful operation and recognition of the events. Usually, the research in the area of automatic surveillance systems is focused on detecting abnormal events based on the acquired video. Using accurate equipped with CCTV cameras that keep a watch on the activities. Unfortunately, CCTV is not sufficient to provide security due to their inability to recognize unusual behaviours themselves and hence monitoring authority needs to monitor tracking algorithms, trajectory extraction can be carried out to further perform trajectory clustering analysis or design representative features model, typical activities and subsequently discover anomalies.

In trajectories which are spatially close and have similar motion patterns are identified and used for detecting unusual events. It proposes a "shape activity" model to describe moving objects and detect anomalies.

The basic idea in this approach is detecting the moving objects from the difference between the current frame and the reference frame. High quality video denoising method in the context of motion based exposure controlled by combining spatial denoising and temporal denoising in a novel way. The processing of the recorded video sequence will do in MATLAB software.

The goal of human activity recognition is to analyze different activities automatically from an unknown video. Analysis of various activities involves recognition of motion pattern and generation of high level description of actions.

There are various approaches caught by the police red-handed because they are informed about the crime instantly. In addition, the system can be used to generate automated alarm that can alert security guard deputed at the security location as well as other people around the premise to obtain immediate security.

Increase in nefarious activities like robbery, murder, and other crimes have raised an urgency to install an effective system that can protect people. Generally security centers are these feeds 24 × 7 which is a challenging task. Today, we need an advanced system that can effectively monitor and automatically recognize unusual crime activities in public places.

II. PROPOSED WORK

- **Design flow**

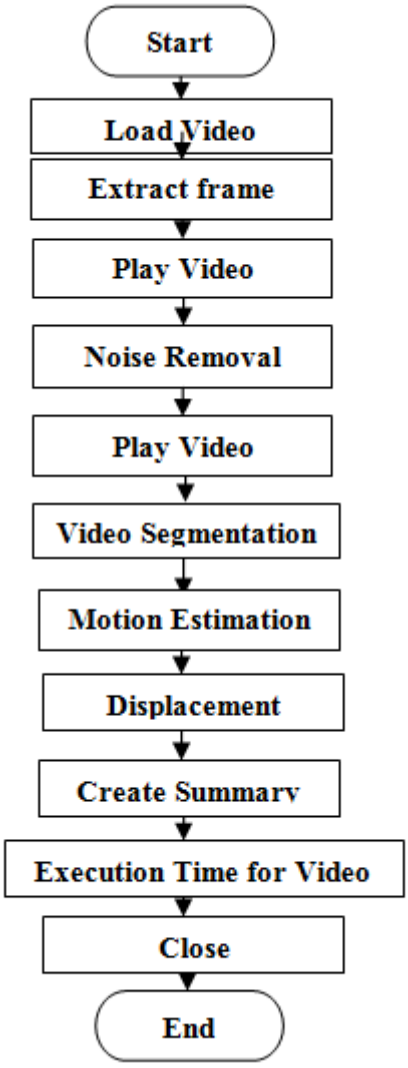


Figure.1. Flowchart of project design

- **Description**

The MATLAB IPT uses the function *VideoReader* to load video files in MP4 format. Use the VideoReader function with the read method to read video data from a file into the MATLAB workspace. In this case, the video files were originally saved in MPEG Format, so used the FFMPEG MPEG-4 or DivX pro codec open source library. The system processes the video frames to extract the information needed to accomplish the event detection purpose. It also analyses the information and finally gives an indication about the state of the event during the video playback. There can be a big variety of events to detect in surveillance videos. The number of events depends on different factors which the system must consider according to the design parameters, purpose of detections, camera locations and probability of events occurring in specific locations.

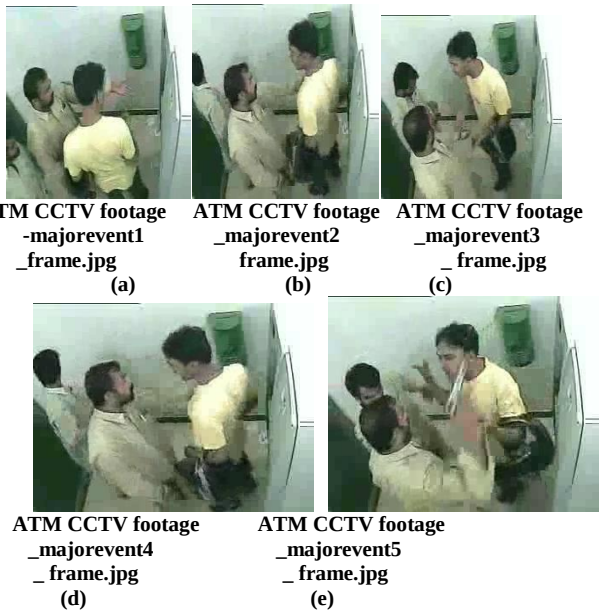
The first step of video acquisition process is extracting the video information which is going to be useful to configure properly the algorithm. Information, such as Number of frames, Frames per second, Height, Width, Quality, etc, is stored in a structure whose fields contain information about the MP4 file specified in the parameter of the function *mmfileinfo* in the IPT. With the function *VideoReader* in the IPT, every frame in the MP4 file is stored as an array of structures where each position in the array corresponds to the structure containing the RGB values for each frame expressed in a 3-D matrix with the dimensions: Height x Width x 3. The number of elements in the array corresponds to the number of frames in the video. If any noise present in respective frame removed by using adaptive median filter given detail in chapter4. In motion segmentation, the objective is to separate foreground from background in the video sequence. A series of morphological operations are performed for each of the foreground images in order to remove isolated pixels, connect adjacent points and remove smaller objects. MATLAB IPT functions are used to perform these operations; first removing small objects, then adjacent points are connected using a disk as structuring element and finally, possible holes are filled to assure consistency in the objects. Motion estimations is the process of determining the movement of blocks between adjacent video frames.

The Foreground Detector system object compares a color or grayscale video frame to a background model to determine whether individual pixels are part of background or foreground. It then computes foreground mask. By using foreground subtraction, you can detect foreground objects in an image taken from stationary camera. The background subtraction scheme works as follows: Each frame is individually compared to a reference background model performing a pixel by pixel comparison. If the current pixel analyzed deviates significantly from the background model, it is considered to be a part belonging to the foreground object and thus, it is labeled as a Foreground pixel. This process uses the concepts for Environmental Modeling and Motion Segmentation combined into a single block which is usually known as Background Subtraction. Extracting the foreground from the background is an important step in the video surveillance pipeline and represents one of the most common tasks when trying to detect moving objects in video sequences. Foreground detection is generally easier in the indoor environment because the outdoor environment is more complex. One of the most generalized methods is the background subtraction for motion segmentation used when the environment modeling described before has a relatively static background.

Moving regions in an image are detected by taking the difference between the current image and the reference background image in a pixel by pixel approach. The final decision is made by analyzing the distances among start-end points as well as end-start points. Distance between start points and end point is performed in order to discard detected events which fail to comply with the minimum duration required to tag the event. On the other hand, distance between end points and start points is intended to identify cases where the event should be continuous; but it has small discontinuities leading to tag different instances of the same event detected. After that we get total execution time for video .Finally, we create summary on that basis, the system is able to specify the start frame and end frame where the event has been identified. This information is useful to perform some statistical analysis according to event annotations based on the ground truth. Moreover, the data is used to show the tagged event during playback, so as to act as an interface with the end user of the video surveillance system. The five majorevents and its duration saved in text file create summary of the video. The video clips are used to test the program. It has been extracted

from the video database provided by DivX, we are using three different videos to test the program.

III. RESULTS AND DISCUSSION



ATM CCTV footage -majorevent1 _frame.jpg (a)

ATM CCTV footage _majorevent2 frame.jpg (b)

ATM CCTV footage _majorevent3 _ frame.jpg (c)

ATM CCTV footage _majorevent4 _ frame.jpg (d)

ATM CCTV footage _majorevent5 _ frame.jpg (e)

Figure.1. Summary (a, b, c, d & e) created by ATM CCTV footage

The ATM CCTV footage video is used to test the system is extracted from the video database provided by DivX player. , the system is able to specify the start frame and end frame where the event has been identified. This information is useful to perform some statistical analysis according to event annotations based on the ground truth. The created summary gives the five major events based on the information in text file. the text file gives information of above five events (a),(b),(c),(d) and (e) as follows: Major event occurs in frames 101, 316, 414, 402 and 309Respectively its durations are 4.04, 12.64, 16.56, 16.08 and 12.36 in seconds. The data is used to show the tagged event during playback, so as to act as an interface with the end user of the video surveillance system.

CCTV footage of Bank Action _majorevent1_ frame.jpg (a)

CCTV footage of Bank Action _ majorevent2 _frame.jpg (c)

CCTV Footage of Bank Action_majrevent3 _frame.jpg (d)

CCTV Footage of Bank Action_Majorevent4 _frame.jpg (d)

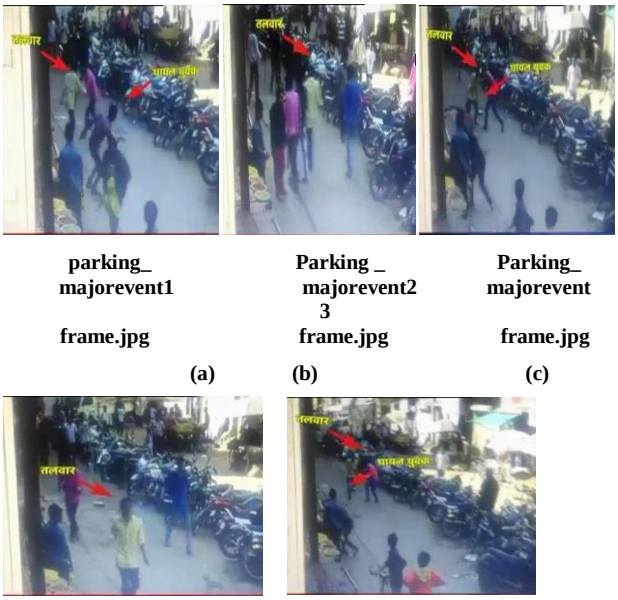
CCTV Footage of Bank Action_Majorevent5 _frame.jpg (e)

Figure.2. Summary (a, b, c, d & e) created CCTV Footage of Bank Action

Similarly, we get five major events with its duration for parking video**.** The text file gives information of above five events (a),(b),(c),(d) and (e) as follows:

Major event occurs in frames 75, 500, 750, 250 and 379.

Respectively its durations are 3.0, 20.00, 30.00, 10.00 and 15.16 in seconds.



parking_ majorevent1 frame.jpg (a)

Parking _ majorevent2 3 frame.jpg (b)

Parking_ majorevent frame.jpg (c)

parking_majorevent4 _ frame.jpg (d)

parking_majorevent5 _ frame. jpg (e)

Figure.3.3Summary (a, b, c, d & e) created by parking video Similarly, we get five major events with its duration for parking video**.** The text file gives information of above five events (a),(b),(c),(d) and (e) as follows:

Major event occurs in frames 206, 33, 190, 295 and 181

Respectively its durations are 6.87, 1.10, 6.34, 9.84 and 6.04 in seconds.

Table.1. Shows values of parameters for videos

S.r No.	Video file name	MSE	RMSE	PSNR	Correlation	SNR
1.	ATM CCTV Footage. MP4	4.323	1.4412	41.7846	0.9951	18.4457
2.	CCTV Footage of bank action.MP4	10.16	1.6125	36.66	0.9942	14.0012
3.	Parking.MP4	4.9737	1.48008	41.3782	0.9976	16.6594

Table.2. Shows Values of attributes of videos

Sr No.	Video file name	Bits/pixels	Frame rate	Height	Width	No. Of frames	Video format	Duration(sec)
1.	ATM CCTV Footage.MP4	24	25	240	320	425	RGB 24	17
2.	CCTV Footage of bank action. MP4	24	25	238	400	875	RGB 24	35
3.	Parking.MP4	24	29.97	360	450	360	RGB 24	12.012

Table.3. Shows summary created by videos and execution time for videos

Video file name	Summary		Execution Time
	Major events occurs at frame no.	Duration (seconds)	
ATM CCTV Footage.MP4	Frame_101	4.04	113.5 sec
	Frame_309	12.36	
	Frame_316	12.64	
	Frame_402	16.08	
	Frame_414	16.56	
CCTV Footage of bank action.MP4	Frame_75	3.00	281.29 sec
	Frame_250	10.00	
	Frame_379	15.16	
	Frame_500	20.00	
	Frame_750	30.00	
Parking.MP4	Frame_33	1.10	176.65 sec
	Frame_181	6.04	
	Frame_190	6.34	
	Frame_206	6.87	
	Frame_295	9.84	

Table.4. Comparative study of proposed work with ATA [1]

Parameters	ATA[1]	Proposed work
PSNR (dB)	33.48	41.57
MSE	9.145	6.48
RMSE	-	1.511
Correlation	-	0.9940
SNR (dB)	-	16.36

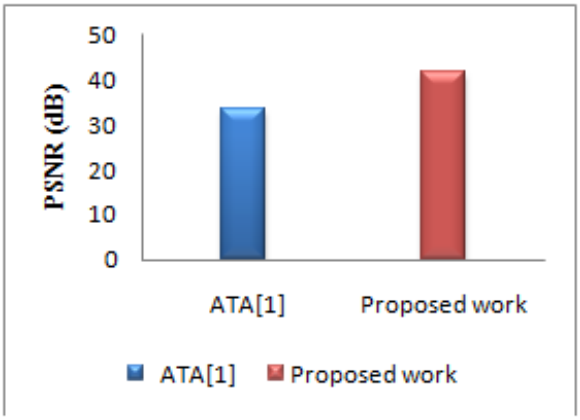


Figure.1. Comparison between ATA [1] and proposed work for PSNR value

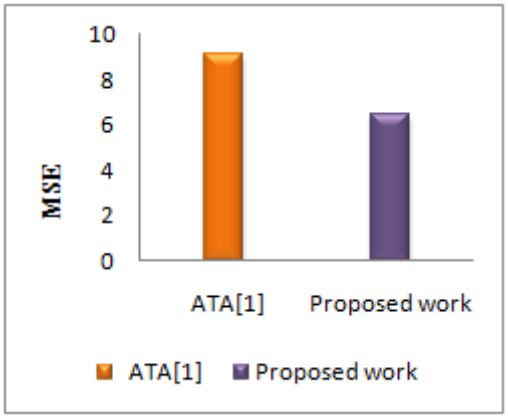


Figure.2. Comparison between ATA [1] and proposed work for MSE value

IV. CONCLUSION

This project gives the basic idea about various techniques used for unusual event detection in the field of video surveillance system. Video surveillance system is very useful in the various field of security. With the use of motion detection we are tracking moving object and identify its activity .Proposed framework presented a noise removal algorithm that can be used to remove noise in frames. The limited amount of information in region of interest improves the response of the system.

V. REFERENCES

[1]. David BARTOVČAK – Miroslav VRANKIĆ: "Video denoising based on adaptive temporal averaging" Vol. 32, Issue 2, 64-69, 2012.

[2]. Erik Marchi1, Fabio Vesperini2, Florian Eyben1, Stefano Squartini2, Bj¨orn : "A novel approach for automatic acoustic novelty detection using Denoising autoencoder with bidirectional stm neural networks".

[3]. Travis Portz , Li Zhang, Hongrui Jiang: " High-quality Video Denoising for Motion-based Exposure Control."

[4]. Ce Liu1, William T. Freeman1,2, "A high quality video denoising algorithm based on reliable motion estimation".

[5]. Dan Xu, Ellisa Ricci: Learning deep representations of appearance and motion for anomalous Event Detection".

[6]. Xiaogang Chen1,3,4, Sing Bing Kang2, Jie Yang1,3, and Jingyi Yu4: "Fast patch-based denoising using approximated patch geodesic paths".CPVR2013.

[7].Robert T. Collins, Alan J. Lipton, and Takeo Kanade, "Introduction to the Special Section on Video Surveillance". VOL. 22, NO. 8, AUGUST 2000

[8]. Antoni Buades, Jose-Luis Lisani, and Marko Miladinovi´c: "Patch-Based Video Denoising With Optical Flow Estimation". VOL. 25, NO. 6, JUNE 2016.

[9]. A. Buades, B. Coll, and J. M. Morel: "A review of image denoising algorithms, with a new one". Simulation, 2005.

[10]. Amit Adam, Ehud Rivlin, Ilan Shimshoni, and Daviv Reinitz. "Robust real-time unusual event detection using multiple fixed-location monitors". IEEE Trans. Pattern Anal. Mach. Intell., 30:555–560, March 2008.

[11].IntelliVision(2014).http://www.intelli-vision.com/products/ intelligent- videoanalytics

[12]. http://www.gris.informatik.tudarmstadt.de/sroth/research/foe.

[13]. N. Sharma, "Analysis of different vulnerabilities in automatic teller machine transactions, "Journal of Global Research in Computer Science,pp.38–40,2012.

[14].http://www.gris.informatik.tudarmstadt.de/sroth/ research/ foe.

[15]. R. Girshick, J. Donahue, T. Darrell, and J. Malik. Rich feature hierarchies for accurate object detection and semantic segmentation. In CVPR, 2014.

[16].http://www.synaxissecurity.com/products/videomanagement-surveillance- systems/truesentry-intelligent-ip-video surveillance-system/.

[17]. M. Ahmad and S.-W. Lee, "Human action recognition using shape and CLG motion flow from multi-view image sequences,"PatternRecognition,vol.41 ,2008.

[18]. http://www.neatimage.com.

[19]. P. Bottoni, "A Dynamic Environment for Surveillance,", 24-28 August, 2009, pp. 892-895.

[20]. INRIA (2004). http://groups.inf.ed.ac.uk /vision/ CAVIAR/ CAVIARDATA1/.

[21].V. Saligrama and Z. Chen. "Video anomaly detection based on local statistical aggregates".In CVPR, 2012.

[22]. L. Zhang, S. Vaddadi, H. Jin, and S. Nayar. "Multiple view image denoising". In CVPR, 2009.

[23].INRIA (2011). http://www-sop.inria.fr/orion/ETISEO/.

[24].IntelliView (2014). http://www.intelliview.ca/. [Accessed 08/06/2014].

[25]. C. Liu, W. T. Freeman, R. Szeliski, and S. B. Kang." Noise estimation from a single image". In CVPR, 2006.

[26].Liu, C., Szeliski, R., Kang, S.B., Zitnick, C.L., Freeman, W.T.: Automatic estimation and removal of noise from a single image. IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI) 30 (2008) 299–314.

[27]. Y. Benezeth, P. Jodoin, V. Saligrama, and C. Rosenberger. "Abnormal events detection based on spatio-temporal co-occurences". In CVPR, 2009.

[28]. C. Liu. Beyond pixels: "exploring new representations and applications for motion analysis. PhD thesis, Massachusetts Institute of Technology", 2009.

[29].TRECVID (2007). http://trecvid.nist.gov/ trecvid. data. html.

[30].W. Hu, T. Tan, L. Wang, and S. Maybank, "Survey on Visual Surveillance of Object Motion and Behaviors", IEEE Transactions on systems and cybernetics,Vol. 34, No. 3, pp. 334-353. August 2004.

[31]. J. Boulanger, C. Kervrann, and P. Bouthemy, "Space-time adaptation for patch-based image sequence restoration," IEEE Trans. Pattern Anal. Mach. Intell., vol. 29, no. 6, pp. 1096–1102, Jun. 2007.

[32]. MATLAB Help.

[33]. C. Pertuz, "Methods and Algorithms for Human Detection in Video Sequences ", Master thesis defense, Florida Atlantic University, 2007.