

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor & UGC Approved Journal)

Website: www.ijirset.com

Vol. 6, Issue 8, August 2017

Detection of Unusual Activities in Crowd

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ABSTRACT- Diagnosing an aberrant event now a day is very necessary. Extraction of unusual event manually is a challenging chore especially in a large number of people gathered in a disorganized way. Various detectors has been introduce but failed to detect abnormal event pattern. To overcome this demerit an abnormality detector algorithm is proposed in this paper to detect the abnormal events. As a result this detector distinguishes abnormal events from the normal once. In this paper, a various techniques are used. Super Vector Machine (SVM) for classification, wavelet transform for feature extraction.

KEYWORDS: video surveillance, Support Vector Machine (SVM), Wavelet Transform, Histogram of Oriented Gradient (HOG).

I. INTRODUCTION

Video surveillances are use in a lot of places because of security purpose. Abnormal event detection processes used in this project was to sensitive to any small movement that it was giving false alarm most of the time hence the proper solution was required to eliminate this problem. Several conditions were introduced in the implementation like wavelet transform for feature extraction, SVM classifier is used to classify the events. The HAAR detection technique is introduced to provide number of moving humans.

Some challenges occur during abnormality detection in crowded scenes are rapid movement of object across frames. Sometimes the illumination is not same across the frame another challenge could be that when we traking complex future. Now we understand that there is need to address these challenges and therefore their is a need for robust and efficient algorithm for detecting abnormal activities.

OBJECTIVES:

The main objectives of the project are as follows:

- To design a model for implementing the abnormality detection algorithm to detectunusual activities.
- To record the video from camera when any unusual activity is detected while absence of the operator.
- To provide instant notification of video clip by uploading the sequence of videocontaining the unusual activity.

The paper is organised as follows.

In Section 2 a survey on previous works on abnormality Detection. Section 3 system architecture of proposed algorithm. In section 4 Experiment is describe. Result of the proposed system is shown in section 5 and we conclude with section 6with future scope of proposed system.

II. RELATED WORK

A method for tackling the problem of abnormality detection, [1] Y. Yuan elt. Proposed a novelstructure modelling of crowd behaviour. They first proposed an informative structural contextdescriptor (SCD) for describing the crowd individual, which originally introduces the potentialenergy function of particles interfere in solid-state physics to intuitively conduct visioncontextual cueing. For computing the crowd SCD variation effectively, then design a robustmulti-object tracker to associate the targets in different frames, which employs the incrementalanalytical ability of the 3-D discrete cosine transform (DCT). By online spatial-temporalanalyzing the SCD variation of the crowd, the abnormality is finally localized. Their contributionmainly lies on three aspects: 1) the new exploration of abnormal detection from structuremodeling where the motion difference between individuals is computed by a novel selective histogramof optical flow that makes the proposed method can deal with more kinds of anomalies;

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2) The SCD description that can effectively represent the relationship among the individuals; and 3) the 3-D DCT multiobject tracker that can robustly associate the limited number of (instead of all) targets which makes the tracking analysis in high density crowd situation feasible. Experimental results on several publicly available crowd video datasets verify the effectiveness of the proposed method.

Russell Stewart¹, Mykhaylo Andriluka^{1, 2}, and Andrew Y. Ng¹ [2] proposed another technique for object detection and exhibited its execution on the TUD Crossing furthermore, Brainwash datasets. The framework addresses the test of identifying different somewhat blocked occasions by disentangling a variable number of yields from rich moderate presentations of a picture. To deliver lucid arrangements of forecasts, they characterized a misfortune work reasonable for preparing our framework end to end. The approach keeps running at 15 outlines for every second on a present day GPU. It imagine that this approach may likewise demonstrate compelling in other forecast undertakings with structured outputs, for example people tracking and articulated posture estimation.

Yie-Tarn Chen et al. [5] has built up another Kullback-Leibler Importance Estimation Procedure (KLIEP)-based plan for irregular discovery in swarmed scenes, which straightforwardly decides the proportion of the test and preparing densities, the significance, as opposed to these densities independently. In view of KLIEP, the significance for every element descriptor of the 3D shapes can be resolved, from which the inconsistency occasions can be recognized.

Hanhe Lin et al. [6] have proposed a novel system to identify oddities in group scenes. By keeping the KKT conditions fulfilled for the augmented informational collection, their approach viably upgrades one-class SVMs models in an online manner. The online calculation alongside the utilization of a sliding window can adjust to new examples and overlook out of date examples in the meantime. Palatable execution is picked up for the recognition of both worldwide and neighborhood peculiarities utilizing benchmark datasets.

III. SYSTEM ARCHITECTURE

In this section, the proposed algorithm is described in detail including block diagram of proposed system, flowchart, and event description. The overall flowchart of the proposed system is shown in figure.

System Architecture:

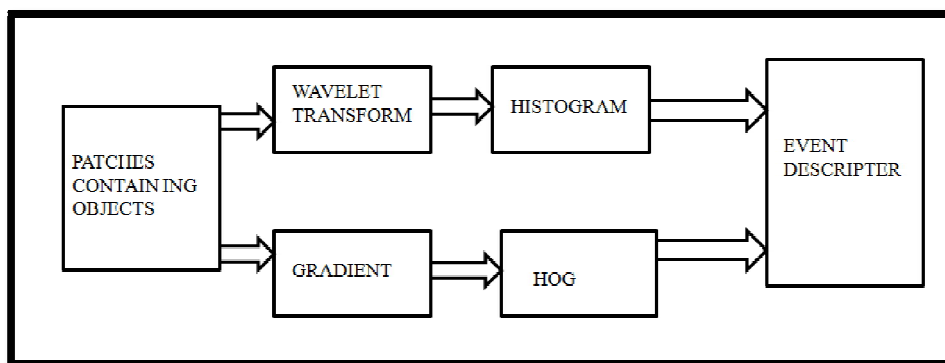


Figure 1: Block Diagram of proposed system.

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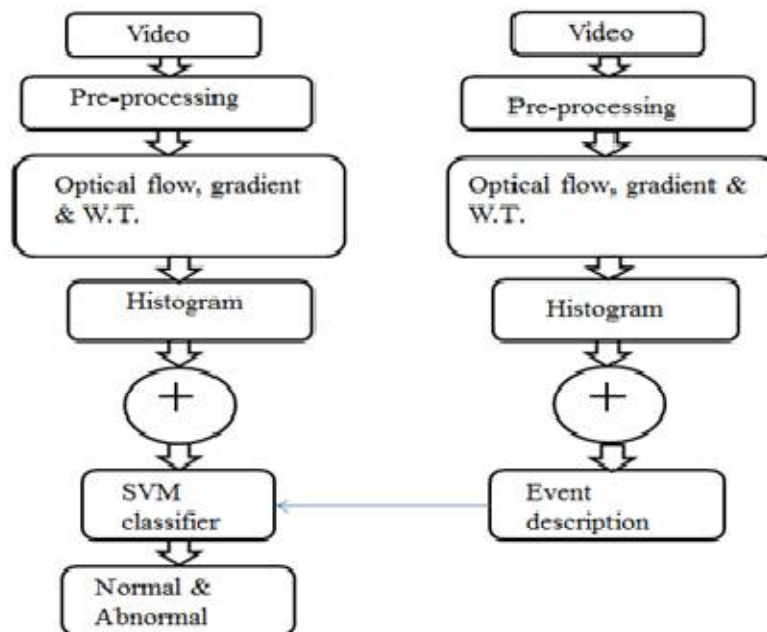


Figure 2: Flow Chart of Proposed system

Description:

In this system we

- First take input video.
- Pre-processing is done.
- After pre-processing Optical Flow and Gradient is calculated with their histogram respectively. Optical flow is for plotting purpose and its find moving vector. Event is described. Wavelet transform is used for feature extraction. WT calculate features like Entropy, Energy, Homogeneity, correlation and contrast.

These steps are done on training phase as well as on testing phase.

- Combining both the result and after that we use classifier. Support Vector Machine (SVM) is used for classification. It classify two different classes, classes are normal and abnormal. SVM compare test set and model. After that it separate the abnormal event and normal event with the help of unique classes and
- display it.

IV. EXPERIMENTS

To justify the intended result of recommend algorithm, qualitative and quantitative estimation with the provision that different real world data sets. Here we use UCSD Ped1 dataset.

a. Dataset

In this paper, we use the UCSD Ped1 dataset to justify the act of proposed algorithm.

This UCSD Ped1 dataset Recorded on UCSD campus. It is of 20-21 video clips in training and testing sets. Composed with 200 frames, Image resolution 158*238 and Features are extracted on 11*11*3 spatio-temporal blocks.

b. Evaluation Criteria

We use the true positive (TP) and false positive (FP) to measure the accuracy of our anomaly detection mechanism.

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The true positive rate is defined as:

$$\text{True positive rate} = \frac{TP}{TP+FN}$$

The true negative rate is defined as:

$$\text{True positive rate} = \frac{TP}{TP+FN}$$

Where, TP is true positive values that correct frame detected. And FN is false negative that is the incorrect detected frames.

And the accuracy calculated as:

$$\text{Accuracy} = \frac{TP+TN}{P+N}$$

Here, P is the number of successful detected frames and N is the total number of actual frames.

ALGORITHMS USED

Optical Flow:

When we have multiple images that is video. So we want to find out how we can analyze the video minimum number of frames we need is two. The most important basic operation in the video analysis is optical flow. Every pixel come up with a vector we call optical flow it is 2D vector. it gives a displacement of each of the pixel compare with previous frame. We write a program which automatically computes optical. There are lots of application of optical flow we can use in segmentation based on motion. Another good application Global alignment of the video. And also use in video compression. The optical flow idea was introduced by Horn&Schunk.

Histogram of Oriented Gradient:

It is used in lot human detection. Idea here is that we will also compute the gradient orientation and magnitude. We compute centred horizontal and vertical gradients with no smoothing. We will do this in the color image but mostly used in gray image. This will look at the image of 64*128 images. Divide 64*128 images into 16*16 with 50 % overlap. Therefore there will be 7*15 total of 105 in blocks. Then each block should consist of 2*2 cells the size with 8*8. Then we are going to quantize gradient orientation here we do in 9 bins. Then we count depending on gradient magnitude how strong is that particular gradient direction. In some cases the some direction is not one of the bins then we do interpolation. Then in this case we can also use Gaussian to smooth the histogram. And we concatenate all the descriptors.

Wavelet Transform:

Basic function of wavelet transform (WT) which are small waves located in different times. WT localized in both time as well as frequency. The wavelet transform is designed in a way that we get good frequency resolution for low frequency components and high temporal resolution for high frequency component. We use Haar wavelet.

Support vector machine:

In our system, we use binary classifier. In classification process first we load trained data to TRN file and current data to be tested in LBL file. SVM_classification compare both the data set and classify the event.

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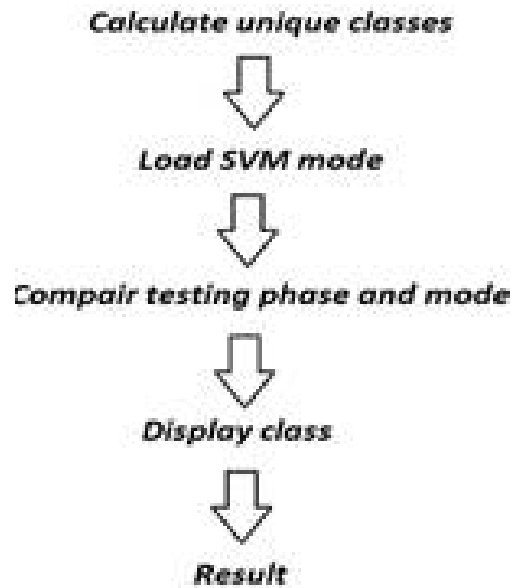


Figure 3: Flow char of SVM

V. RESULTS

Following figures shows the screen-shots of the result. When any movement happens the system will analyse the incoming video stream. The video clips are encoded in .avi format. The output produced by the system is shown below: Visualize the final result with confusion matrix. The numbers in the bottom side of the matrix give the overall accuracy. We achieved the final accuracy of 96.48% as shown.

No of Data set Frames= 1000

Positive (P)=843

Negative (N)= 123

True Positive(TP)=823

True Negative(TN)=109

$$\text{Accuracy} = \frac{TP+TN}{P+N} = \frac{823+109}{843+123} = 96.48\%$$

$$\text{True positive rate} = \frac{Tp}{TP+FN} = \frac{823}{823+177} = 82.3\%$$

$$\text{True negative rate} = \frac{TN}{TN+FP} = \frac{109}{109+891} = 19.1\%$$

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INPUT IMAGE



Figure4 : Input Image

GRAY IMAGE

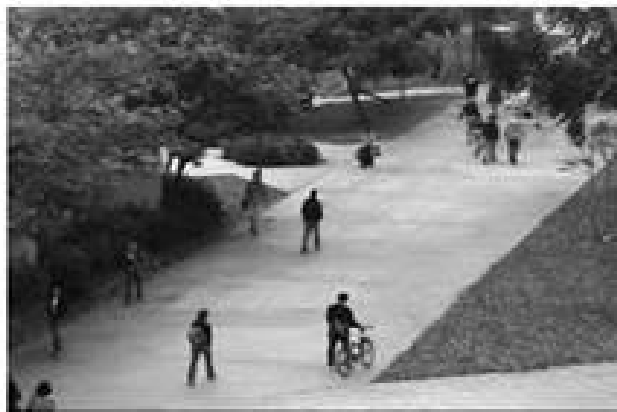


Figure5:Gray Image

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GRADIENT IMAGE



Figure6: Gradient Image



Figure 7: Optical Flow

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Figure 8: Final output contains normal event.

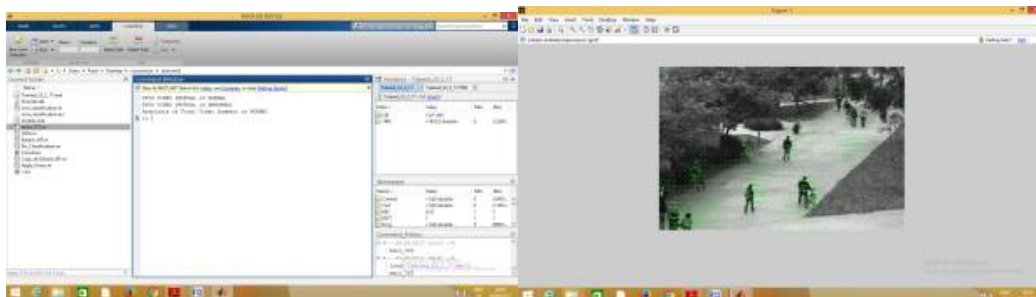


Figure 9: Final out contains some normal and abnormal events .

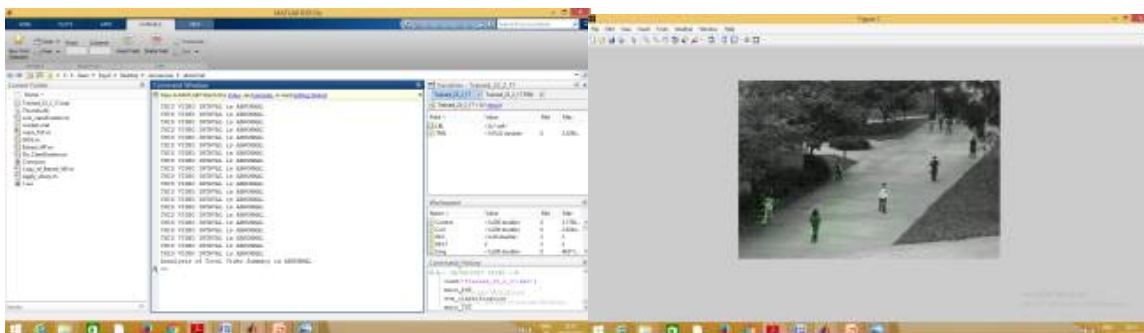


Figure10: Final out contains abnormal events.

The figure4 is showing input image. Input image containing some noise. To do somefurther processing we required noise free image. The noise free image we can get by converting input image into gray image. Figure 5 shows gray image of given input image. Figure6 shows Gradient image. The image gradient is used to extract information from images. An image gradient is directional change in the intensity or colour in an image. The edge detector uses image gradient for edge detection. Each pixel of gradient image measures the change in intensity of the same point in original image in an original direction. The pixel with the largest gradient values in the direction of the gradient becomes edge pixels, and the edges may be traced in the direction perpendicular to the gradient direction.

Figure 8 shows the final output of normal event. Figure 9 shows video contains some normal as well as abnormal event and in figure 10 all events are abnormal. Here we can represent abnormal event as normal but cannot shows normal event as an abnormal event. Hence false detection is decrease.

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VI. CONCLUSION AND FUTURE WORK

In this we introduce algorithm of a system which extract abnormal event accurately. Here we can represent abnormal event as normal but cannot shows normal event as an abnormal event. Hence false detection is decrease. Algorithm use in this are SVM, WT, HOG are efficiently and effectively help in finding abnormality.

Further enhancement in abnormality detection algorithm can open up the door to implement this concept for outdoor surveillance system as well as for border security. The proposed system shows the real time requirements can be fulfilled by this approach hence if it is to be manufactured in large scale then there is wide scope in improvement of intelligence of system in terms of more lightweight software approach.

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