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MRF Model for Detecting Abnormal Activates in Crowded Environments

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ABSTRACT

This paper focus on detecting unusual activities in video. The analysis of motions and behaviours in crowded scenes constitutes a challenging task for traditional computer vision methods. To overcome this disadvantage there are different methods are used to detect the abnormalities in the video. This proposed method shows that a space-time MRF (Markov Random Field) model for detecting abnormal activities like bicycle passing through a crowd. This method not only localizes abnormal activities in crowded scenes, it can also capture the irregular interactions between local activities in a global sense. Histograms of Oriented Gradients (HOG) are used for capture the image from the particular video. The extraction of appearance characteristics in Region Of Interest (ROI) tracked over time using HOG descriptor. The robustness of this method in practical application can be understood by applying it on long surveillance videos.
Keywords: MRF, HOG, ROI

I. INTRODUCTION

The surveillance camera used in many places like roads, stations, airports or malls for the security purpose. The challenging work of automatically detecting frames with anomalous or interesting events from long duration video sequences has concerned the research area in the last decade. Anomaly detection in crowded scenes is very important, example for safety purpose, where it is difficult even for trained personnel to reliably monitor scenes with more crowds or videos of long duration. Many methods have been proposed to assist in this direction.

The practical problem of abnormality detection remains quite challenging technically and it also hard to find. The initial challenge is that "unusual" things naturally occur with random variations, making it tough to distinguish a really abnormal event from noisy normal observations. Also, the visual context in a scene inclines to change over time.

The investigation of motions and behaviours in crowded scenes founds a interesting task for traditional computer vision methods, as barriers like occlusions, varying crowd densities and the complex stochastic nature of their motions are difficult to overcome. Computational cost is one more complicating factor, as it has to be kept within reasonable limits. In many practical situations, it is critical to analyze crowded scenes in real time, or at least as fast as possible, considering the fact that security personnel should act quickly if somewhat appears to be "not as usual."

In this paper, we introduce a space-time Markov Random Field (MRF) model that addresses these two primary tasks. To build a MRF graph, we divide a video into a grid of spatio-temporal local regions. Every region agrees to a single node, and adjacent nodes are connected with links. A new method for anomaly detection and localization that includes both motion and appearance information. We introduce a descriptor created from Histograms of Oriented Gradients (HOG) to capture appearance.

Swarm intelligence has been used in the past only in the framework of element Swarm Optimization (PSO) in [1], where PSO enhances a fitness function reducing the interaction force derived from the Social Force Model (SFM). Even though significant research has taken place on event and anomaly detection from static cameras [2], [3] the majority of these works address non-crowded scenes, where detailed visual information can be subject for each individual.

II. METHODS AND MATERIAL

A. HOG Descriptor

The histogram of oriented gradients (HOG) is an important descriptor used in computer vision and image processing aimed at the purpose of object detection. This method sums existences of gradient orientation in localized slices of an image. This technique is like to that of edge orientation histograms, scale-invariant feature transform descriptors, and the shape contexts, nevertheless varies in that it is computed on a dense grid of uniformly spaced cells and uses covering local contrast normalization for improved accuracy.

HOG extraction used to detect the objects. The image is divided into small connected regions called cells, and for the pixels within each cell, a histogram of gradient directions is compiled. To improve the accuracy, the descriptor is then the concatenation of these histograms.

B. Gradient Computation

The initial stage of design in many feature detectors in image pre-processing is to guarantee normalized colour and gamma values. Though, this step can be omitted in HOG descriptor computation, as the following descriptor normalization essentially reaches the same result. Image pre-processing therefore offers little effect on performance. Instead, the leading step of calculation is the calculation of the gradient values. The best common method is to apply the 1-D centered, point discrete derivative mask in one or together of the horizontal and vertical directions. Exactly, this method needs filtering the colour or intensity data of the image.

C. MRF Model for Abnormal Detection

Markov Random Field (MRF) model to detect irregular activities in video. The nodes in the MRF graph correspond to a grid of local regions in the video frames, and adjacent nodes in both space and time are related with links. MRF model robustly detects abnormal activities both in a local and global sense. Figure 1 shows the flow diagram of this method.

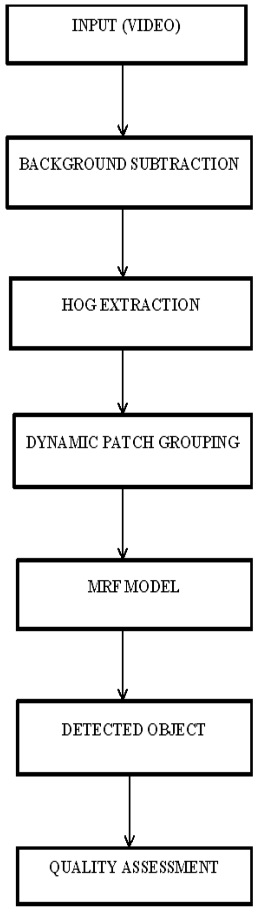

Figure 1 : shows the flow diagram of the MRF based abnormal detection in video.

III. RESULTS AND DISCUSSION

For the abnormal detection here taking presence of abnormal video (figure2). The input video containing many frames, each frames are considering for calculating the irregular events present in the video. To detect the abnormal event background subtraction is very essential. Background subtraction is also known as Foreground Detection.

Figure 2. Shows the abnormal event video screenshot

Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. A motion detection algorithm begins with the segmentation part where foreground or moving objects are segmented from the background.

Mathematical equation

$$P[S(t)] = P[F(t)] - P[B] \quad \text{----------(1)}$$

P[S(t)]-Subtracted image

P[F(t)] -pixel value of foreground image

P[B] -pixel value of background image.

Figure 3. Shows the background subtraction

The next step of finding the abnormal detection is HOG extraction figure(4). In this step each frame is split into small blocks to increase the accuracy level and detection ratio. From this extraction we can monitor frame by frame level to find the abnormal in the input video.

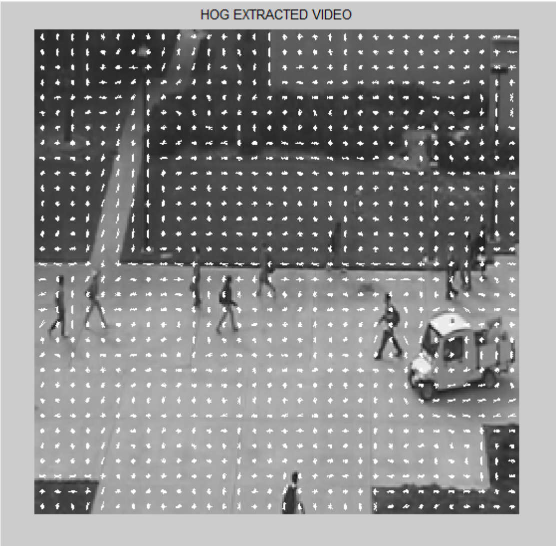

Figure 4. Shows the HOG extraction

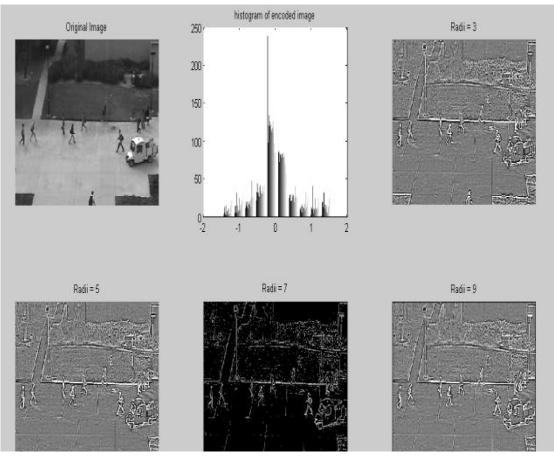

Figure5 shows the histogram oh the encoded images.

Dynamic patch grouping is the one of the stage to detect the abnormal event in the video. In this non overlapping block also used to improve the accuracy of the markov random field of abnormal event detection.

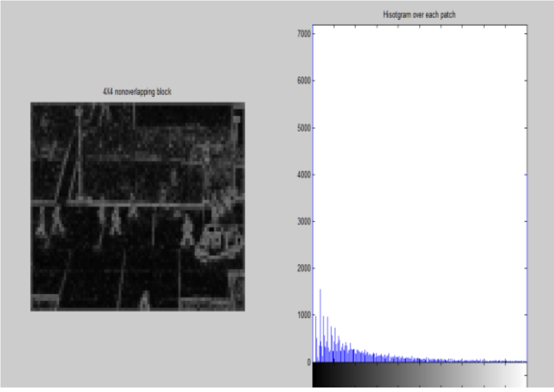

Figure 6. Shows the dynamic patch grouping.

The final step of this method is applying the markov random field to the abnormal event video. This method is used find the abnormal event present in the video. Markov random field is used to detect the abnormal event in the video and also graphical representation of the detected object also showed in the image (figure7). The red line indicating the abnormal event in the input video.

Figure 7. Shows the detected abnormal event.

IV. CONCLUSION

In this work a novel method of MRF model is applied to detect the abnormal events. Here HOG is applied to each frame of the input video. Pixel level criteria of the detection rate are when compared to other methods and also frame level criteria of the error rate are low in the markov random field model. This method is can be used in many application of security purpose where the surveillance camera is available.

V. REFERENCES

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