ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

Abnormal Activity Detection using HOG Features and SVM Classifier

Pooja G, Revansiddappa S Kinagi

M. Tech Student, Dept. of ECE, Appa Institute of Engineering and Technology, Gulbarga, India

Assistant Professor, Dept. of ECE, Appa Institute of Engineering and Technology, Gulbarga, India

ABSTRACT*:* The abnormal activity detection has experienced increasing attention over years, due to its usefulness in pervasive applications. In order to meet the real-time needs and overcome the high costs and privacy issues, in this paper, we develop a new model for detecting abnormal activity using HOG features and SVM classifier . Firstly we take videos as input sample and generates input frames. To foreshorten human motions accurately and efficiently, the Histogram of Oriented Gradient (HOG) features are employed and PCA for feature reduction. On the basis of result from feature reduction the SVM classifier classifies the activity of our input video.

KEYWORDS*:* Histogram of Oriented Gradient (HOG), SVM classifier, PCA.

I. INTRODUCTION

It is very important to automatically read the human activities from videos, because from the fast few years a wondered success of social networks and multimedia technologies, moving forward to the generation of vast amount of videos are getting uploaded, in order to provide value added service to the end user, number of research studies have focused on this particular challenging topic. Even though massive progresses in human action recognition have been achieved by recent studies, there are still two problems which need to be considered for its future enhancements.

Firstly, the actions of human may be overlapped by background changes or camera motion. Especially, camera motion may interfere with detecting the true human activity. Secondly, it is still challenging to recognize human activities in realistic unconstrained videos because of a large amount of intra-class action variations. In this paper, we consider the challenging problems mentioned above, and focus on videos frameworks and developing a model for detecting abnormal activity using HOG features and SVM classifier.

There are two phases in this architecture, training phase and testing phase. In training phase we consider normal and abnormal images as input sample mages, sample images which we are using as input sample are taken from the videos which we are testing and later those images are pre processed from color images to gray scale images. To foreshorten human activity accurately and efficiently, the Histogram of Oriented Gradient (HOG) features are employed and PCA for feature reduction , result from feature reduction are trained to SVM classifier and will dumped to knowledge base as a result database. In this phase we train the SVM classifier to classify the human activity on the basis of result. In testing phase we consider human activity video as input and generate the frames of that video, pre process the video and to foreshorten human activity accurately and efficiently, the Histogram of Oriented Gradient (HOG) features are employed and PCA for feature reduction , SVM classifiers compares the images in knowledge base with the human activity in the frames of videos and returns the result according to the human activity.

II. LITERATURE SURVEY

H. Wang et.al [1] has proposed a system on dense trajectories and motion boundary descriptors for action recognition. Typically, they can be extracted by using some kind of motion tracking techniques, such as the Kanade-Lucas-Tomasi (KLT) tracker features. M. A. Fischler et.al [2] has proposed a system on Random sample consensus: a paradigm for model fitting with applications to image analysis and automated cartography, in which in which the Scale Invariant Feature Transform (SIFT) keypoints are separately tracked at each spatial scale by the technique of dense optical flow, and camera motion elimination is employed to construct robust trajectories. N. Dalal et.al [3] has proposed a system on human detection using oriented histograms of flow and appearance, by using histogram they demonstrated the human

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

activity and to foreshorten human activity accurately and efficiently, the Histogram of Oriented Gradient (HOG) features are employed. Haiam A Et.al [4] has proposed a system on Human action recognition using trajectory-based representation, in which the effectiveness of the proposed approach was evaluated on three popular datasets (KTH, Weizmann and UCF sports).

III. METHODOLOGY

Figure1 represent the overall representation of proposed system. The system consists of two phases they are training phase and testing phase.

In training phase we consider normal and abnormal images as input sample mages, sample images which we are using as input sample are taken from the videos which we are testing and later those images are pre processed from color images to gray scale images. To foreshorten human activity accurately and efficiently, the Histogram of Oriented Gradient (HOG) features are employed and PCA for feature reduction , result from feature reduction are trained to SVM classifier and will dumped to knowledge base as a result database. In this phase we train the SVM classifier to classify the human activity on the basis of result.(HOG) features are employed and PCA for feature reduction , SVM classifiers compares the images in knowledge base with the human activity in the frames of videos and returns the result according to the human activity.

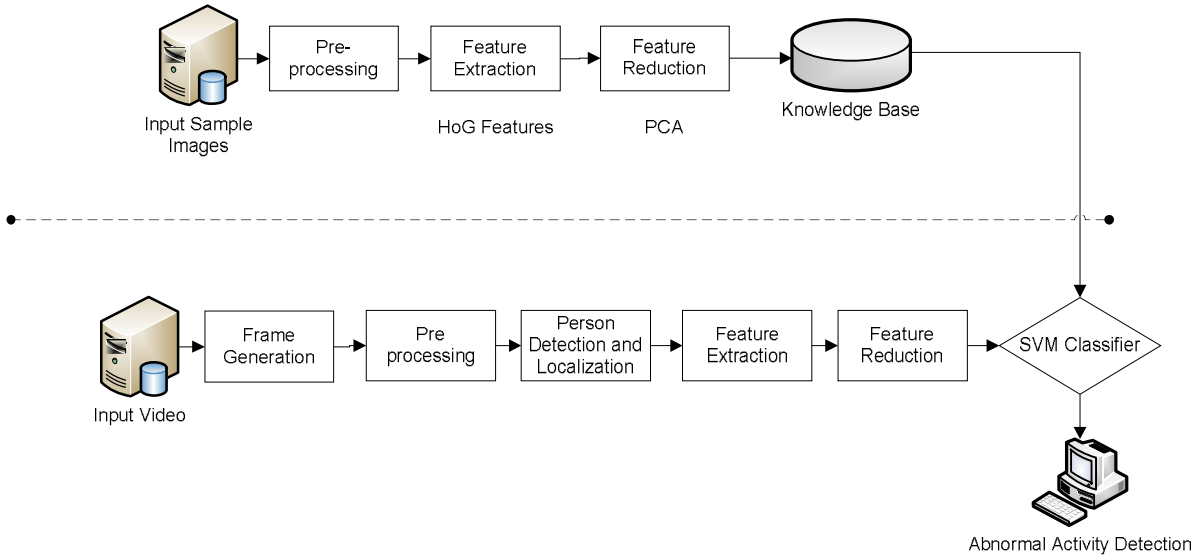

Figure 1: Block Diagram of proposed system.

A. HOG FEATURES

HOG stands for Histograms of Oriented Gradients. HOG is a feature descriptor. To make the classification task easier under different conditions, feature descriptor is there to generalize the object in such a way that the same object (in this case a person) produces as close as possible to the same feature descriptor. The creators of this approach trained a Support Vector Machine (a type of machine learning algorithm for classification), or "SVM", to recognize HOG descriptors of people. The HOG person detector is very simple to understand. The HOG will not use a collection of local features rather than it uses a global feature to describe a person. Person is represented by a single feature vector, as opposed to many feature vectors representing smaller parts of the person. The HOG person detector uses a sliding detection window which is moved around the image. A HOG descriptor is computed at each position of the detection window. This descriptor is then deployed to the trained SVM, which classifies it as either normal or abnormal. The image is sub sampled to multiple sizes in order to recognize persons at different scales.

B. PRINCIPAL COMPONENTS ANALYSIS (PCA)

The PCA is one of the best statistical data analysis method which transforms the initial set of variables into an assorted set of linear combinations, such combinations are called as principal components (PC), with respect to variances along with specific properties. This reduces the feature of the system while maintaining data on the variable connections.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

On the basis of result of calculation and analysis of data covariance matrix, a data set is analysed, its Eigen values along with its respective eigenvectors systematized in descending order. Feature Reduction is a process used in Data Mining, in which numbers of random variables under consideration are reduced. There are two categories in feature reductions one is for selecting subgroups of all the feature this category is referred as Feature Selection, another one is for combining the existing feature with a new subset of the combinations is created that is referred as Feature Extraction. For Feature Extraction most commonly used technique is Principal Components Analysis (PCA). PCA uses a signal based representation criterion where the purpose of feature extraction is to represent the samples accurately in a lower dimensional space whereas the alternate technique, classification based approach is deployed through Linear Discriminate Analysis (LDA). In the high-dimensional space PCA performs dimensionality reduction whilst maintaining maximum feasible arbitrariness. As the high dimensional datasets can be condensed to a lower dimension (2D OR 3D) it can be seen as a data visualization method and then plotted using graphs or visualized using charts. Simple Principal Components Analysis (SPCA) underwent testing and assessment with other techniques in case of featured reduction of two highly dimensional picture database. When compare with other methods of feature reduction for highly dimensional picture, SPCA provides a quick convergence rate and stability to the reorganization of the samples. Without the requirement of calculating a variance-covariance matrix followed by its diagonalization a simple PCA (SPCA) method can produce estimated solutions. It is independent of many training parameters like neural networks. Predominantly, for highly dimensional datasets, SPCA is much quicker than other existent procedures. There are two principal methods used for PCA they are Matrix method and the Data method. In the Matrix method, all of the data present in the datasets are used to calculate the variance covariance structure and express it in the form of a matrix. The matrix is further disintegrated and a diagonalization technique is applied. Data methods on the other view, work directly with the data. In SPCA, as we use the data oriented approach so there is no matter of computing the matrix and also, no learning parameters are required. Before clustering happens, PCA is used to lower the dimensionality of the data set. Using PCA before cluster analysis could abet in an improved drawing out of the cluster organization in the data set. In cluster analysis typically we use the Principal Components which are still not yet ordered, among those we use first few PCs that consist of maximum variations in the data. PCA is used to test how well the genes that were extracted depict the normal variance between the data, thereby getting rid of the variance due to any other sources to the highest potential degree. Moreover, PCA can be used as a platform to contrast between the performances of various different methods used to establish normal variance. The main disadvantage noticed in PCA is that it gives no consideration to class reparability because it does not account for the class label of the feature vector. PCA exactly performs a coordinate rotation that aligns the coordinate axes transformed earlier, along the directions of maximum variance. There is no guarantee that the directions of maximum variance will comprise of features worthy enough for discrimination.

C. SVM CLASSIFIER

Support vector machines. In order to achieve the optimal separating hyper-plane in the higher dimensional feature space, SVM first maps the input vector into a higher dimensional feature space. Furthermore, a decision boundary, i.e. the separating hyper-plane, is determined by support vectors rather than the whole training samples and thus is extremely robust to outliers. Exactly an SVM classifier is designed for binary classification. That is, to separate a set of training vectors which belong to two different classes. Note that a decision boundary similar to the support vector i.e. training samples. The SVM also provides a user specified parameter called penalty factor. It allows users to make a tradeoff between the number of misclassified samples and the width of a decision boundary.

Training (Learning)

• Represent each example window by a HOG feature vector

• Train a SVM classifier

Testing (Detection)

• Sliding window classifier Algorithm

$$f(x) = W > X + b\, X_i \in R_d, with\ d = 10 \qquad (1)$$

IV. EXPERIMENTAL RESULT

The experimental result for the above discussed methodology is discussed in this section. By taking the videos generated from the video frames shown in Figure.2 (a) these video frames are converted into binary images by applying pre-processing technique as shown in Figure.2 (d) of both normal and abnormal images. Next human detected images are

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

shown in Figure.2 (e) of both normal and abnormal activity, finally according to the human detected image the system will identify whether the activity is normal or abnormal shown I Figure.2 (f).

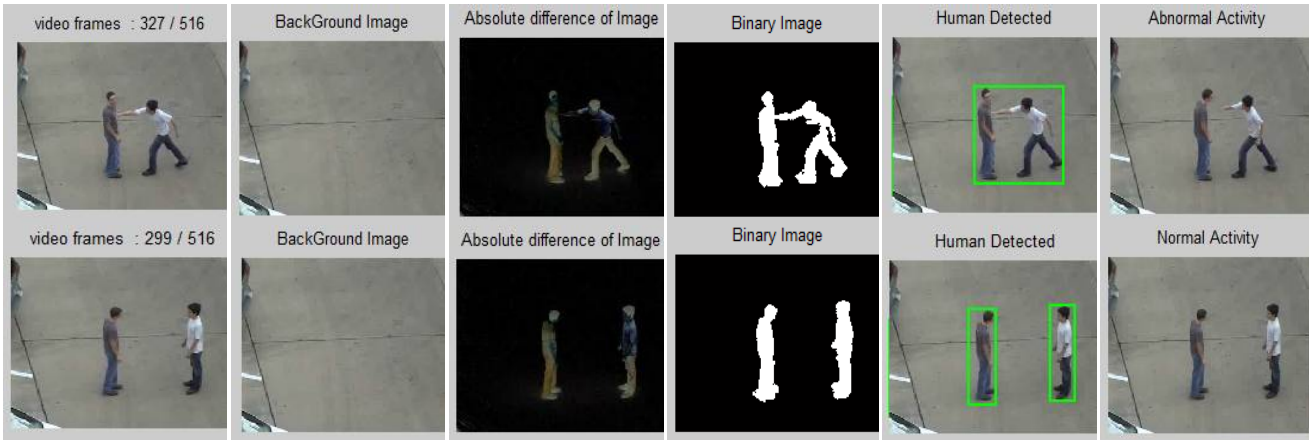

Figure 2: (a)Input image; (b)Background image; (c)Absolute difference of image; (d)Binary image; (e) Human detected image; (f) Result .

V. CONCLUSION

This paper proposes a new model for detecting abnormal activity using HOG features and SVM classifier. The philosophy behind the proposed approach is to foreshorten human motions accurately and efficiently, the Histogram of Oriented Gradient (HOG) features are employed and PCA for feature reduction. On the basis of result from feature reduction the SVM classifier classifies the activity of our input video. Extensive experimental results verify the efficiency of the proposed abnormal activity detection using HOG feature and SVM classifier and demonstrate that the proposed approach is superior to other approaches to recognize.

REFERENCES

[1] H. Wang, A. Kl¨aser, C. Schmid, and C.-L. Liu, “Dense trajectories and motion boundary descriptors for action recognition,” IJCV, vol. 103,no. 1, pp. 60–79, 2013.
[2] M. A. Fischler and R. C. Bolles, “Random sample consensus: a paradigm for model fitting with applications to image analysis and automated cartography,” Commun. of the ACM, vol. 24, no. 6, pp. 381–395, 1981.
[3] N. Dalal, B. Triggs, and C. Schmid, “Human detection using oriented histograms of flow and appearance,” in ECCV’06, 2006, pp. 428–441, 2004.
[4] Haiam A and Abdul-Azim, "Human action recognition using trajectory-based representation", Cairo University, Vol. 16, Issue 2, PP. 187-198, 2015.
[5] N. Dalal and B. Triggs, “Histograms of Oriented Gradients for Human Detection”, IEEE, Vol. 1, pp. 886 – 893, 2005.
[6] R. Messing, C. Pal, and H. Kautz, “Activity recognition using the velocity histories of tracked keypoints,” in ICCV’09, pp. 104–111, 2009.
[7] H. Kuehne, H. Jhuang, E. Garrote, T. Poggio, and T. Serre, “HMDB: A large video database for human motion recognition,” in ICCV’11, pp. 2556–2563, 2011.
[8] M. A. Fischler and R. C. Bolles, “Random sample consensus: a paradigm for model fitting with applications to image analysis and automated cartography,” Commun. of the ACM, vol. 24, no. 6, pp. 381–395, 1981.
[9] F. Perronnin and C. Dance, “Fisher kernels on visual vocabularies for image categorization,” in CVPR’07, pp. 1–8, 2007.
[10] J. C. Niebles, C.-W. Chen, and L. Fei-Fei, “Modeling temporal structure of decomposable motion segments for activity classification,” in ECCV’10, pp. 392–405, 2010.