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Smart Video Surveillance

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Abstract:
Intelligent video – surveillance (IVS) system are being the more and more important in the security applications for providing the security and protection for the people. The analysis and recognition of abnormal behavior in a video data and the technology used in the intelligent video camera forces us to pay attention in the security field. This paper presents the intelligent pre-alarm for abnormal events, smart storage for surveillance video and rapid retrieval. The Abnormal activity detection plays a crucial role in the surveillance application and surveillance system that can perform robustly in an academic environment has become an urgent need.

Keywords: Abnormal behavior, (IVS) intelligent video surveillance, security field, intelligent pre-alarm.

I. INTRODUCTION:

The camera attached to monitor screens are generally a traditional video surveillance system. But now days it is important that we need to identify anything normal or abnormal in order to handle the situation and for provide security for the living people. By using the machine learning which uses two types of techniques, supervised and unsupervised learning especially by supervised learning we can be able to train a model of known input and output data so that it can predict the future output. And in the existing system they have used artificial immune system, fuzzy clustering ,naïve Bayes algorithm and some of the clustering methods such as radius-based, ant-base one which are specially used for identifying the abnormal events from the video set. The amount of false alarming resulted from the data explosion is beyond the limitations of manual processing. Traditional methods for obtaining evidences highly depend on the surveillance video within or near the accident site. However when the incident passes through a wide range of space and time, it is hard to find any valuable evidence on the criminals from massive surveillance video, which hampers the efficiency of resolving the cases. In this paper we have used three algorithms for classifying the abnormal events in which the main algorithm is logistic regression and the other two algorithms SVM (Support Vector Machine) and KNN (K-Nearest Neighbor) isused for comparing the accuracy gathered from the Logistic Regression. Some new identification and scrutiny on the suspicious activity allow us to optimize intelligent processing of surveillance video data. First, criminals often insect various places in different time before committing crimes, which are captured and are located in different sites. Through temporally and spatially associative false alarming can be ruled out.

II. LITERATURE SURVEY:

1) Norul Uyuun Mohd Noor, Hezerul Abdul Karim, Nor Azhar Mohd Arif, Mohd Haris Lye Abdullah
Multi-view video plus depth representation with saliency depth video
This paper proposed a saliency depth based video by utilizing selected saliency maps and fusing it into depth video sequences. The proposed saliency depth based model is used with multi-view video plus depth (MVD) and compressed using the latest High Efficiency Video Coding (HEVC) compression method. The proposed method showed anotable quality improvement on the virtual view video compared to other saliency model such as the frequency-tuned saliency model.

2) Ye Yao, Ying Cheng, Xiaodong Li
Video Objects Removal Forgery Detection and Localization
According to the application requirements of authenticity and integrity of video sequence, the research topic of video objects removal detection and localization is discussed. We propose a three step framework for the purpose of locating the tampered objects in video sequences with a moving background which is captured by a moving camera. At the end, we give out the research challenges.

3)Shaoge Guo, Yaowei Wang, Yonghong Tian
Quality-progressive coding for high bit-rate background frames on surveillance videos
Moreover, the modeled background frame and the residual frames should be encoded into the bit-stream and transmitted every several frames, and the coding bits of two frame types above should be limited to the target range of coding bits, which is based on the channel capacity, so that avoids the bursting bit-rate peak and the transmission delay. Background frames are reconstructed by summing up the basic part and reconstructed residual frames one by one, and the last reconstructed background frame becomes a high-quality reconstructed background frame. Of course, each reconstructed background frame act as a prediction reference for its subsequent frames. Experimental results on an opening dataset, PKU-SVD-A, show that the proposed approach can smooth the bit-rate of high quality reconstructed background frame in surveillance video coding, and achieve 0.57% bit-rate saving on average compared with HEVC-S.

III. EXISTING SYSTEM:

The existing intelligent system can only detect and alarm single abnormal events yet without bridging the spatial and temporal association among multiple unusual events.

However, it is not convincible to judge suspicious behavior by a single monitoring.

IV. PROPOSED SYSTEM:

The proposed system advocates an intelligent processing approach to big surveillance video data driven by smart front-end cameras. In our approach, we do not natively and passively receive and process the alarming information from smart front-end cameras, but make full use of spatial and temporal attributes of multi-site monitoring cameras. This approach will disclose the intrinsic relationship and reveal pattern among a number of seemingly separate abnormal behavior.

ADVANTAGES:

This way, we can improve the alarming accuracy of the abnormal behaviors with inherent association, the efficiency of the video preservation association with the abnormal behaviors, and the discovery efficiency of the case clues under the abnormal behavior constraint.

V. ALGORITHMS USED FOR ABNORMAL EVENT DETECTION

I)K-NN (K–NEAREST NEIGBOR):

The k-nearest neighbor classifier is the simplest classifier among all other. In general it does not "learn" anything. This algorithm simply relies on the distance between feature vectors, only this time, we have labels for each images(frames) so we can predict and return an actual category for the video. For the implementation of the KNN algorithm k value will choose which is a parameter refers to the number of nearest neighbor this process is called parameter tuning which is very important for the accuracy. The value chosen for "k" should be odd then only it will be easier to avoid the confusion.

It works by finding the distance between the two points in a plane using Euclidean formula:

$$dist(d) = \sqrt{(x-a)^2} + \sqrt{(y-b)^2}$$

We develop the model to produce test accuracy, best hyper-parameter and corresponding mean accuracy.

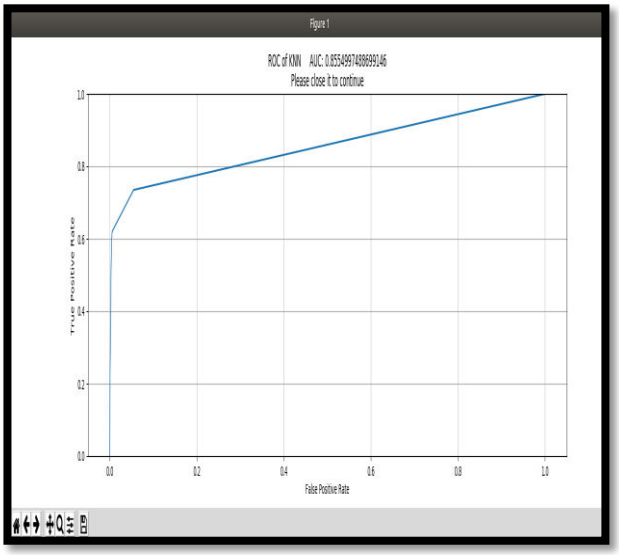

Figure.1. ROC-curve for KNN

II) SVM (SUPPORT VECTOR MACHINE):

"Support Vector Machine" (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. Support Vectors are simply the co-ordinates of individual observation. Support Vector Machine is a frontier which best segregates the two classes (hyper-plane/line).

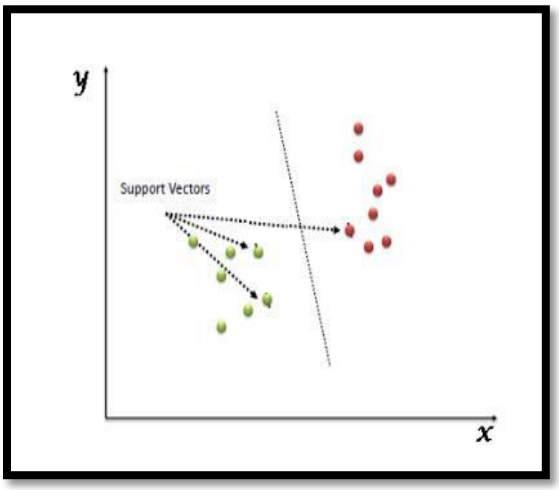

Figure.2. separation of two classes using line/hyper-plane.

After segregating the two or more classes according to the situation then we have to identify the right hyper-plane. The line that has the maximum space that separates the two classes is the "best split". Most of the time your data will be composed of n vectorsx_i. Each x_i will also be associated with a value y_i indicating if the element belong to the class (+1) or not (-1).

For y_i can only have two possible values -1 or +1. Moreover, most of the time, for instance when you do text classification, your vector x_i ends up having a lot of dimensions. We can say that x_i is a p-dimensional vector if it has p dimensions. So your dataset D is the set of n couples of element (x_i, y_i)The formal definition of an initial dataset in set theory is:

$$D = \int_{i=1}^{n} \{(x_i, j_i) | x_i \in \mathbb{R}^p, \in \{-1,1\}\}$$

SVM algorithm has been modeled to display the test accuracy which will be compared with the test accuracy of logistic regression and area under curve of ROC.

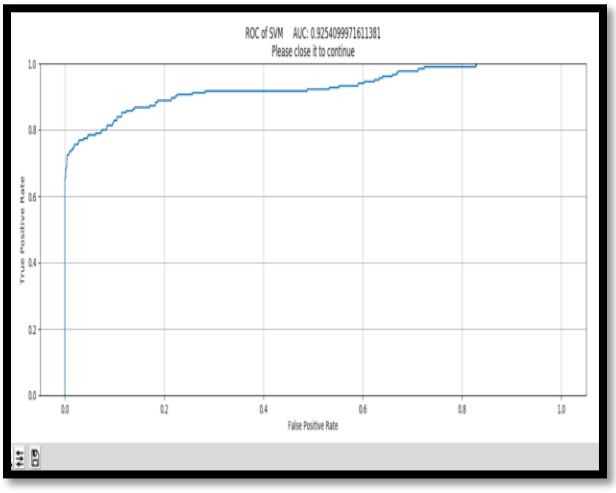

Figure. 3. ROC-curve for SVM

III) LOGISTIC REGRESSION:

A dataset with one or more independent variables is used to determine binary output (0 or 1) (i.e.) true or false of the dependant variable. It will be implemented using the logistic regression curve in which threshold value has to be set saying that any value above the threshold will be true and any value below will be false.

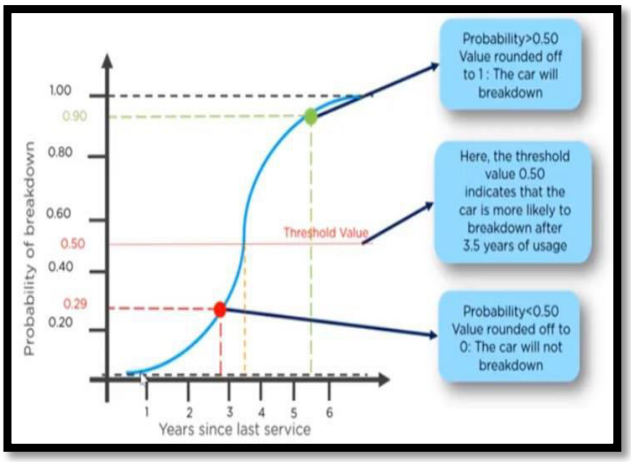

Figure.4. logistic curve for some car breakdown example.

Math behind logistic regression:

$$\theta = \frac{p}{1-p} = \frac{probability\ of\ event\ occurring}{probability\ of\ event\ not\ occurring}$$

The values of θ range from 0 to ∞ and the values of probability changes from 0 to 1. Then by applying log on both side of the above equation allow us to get the sigmoid function as shown below:

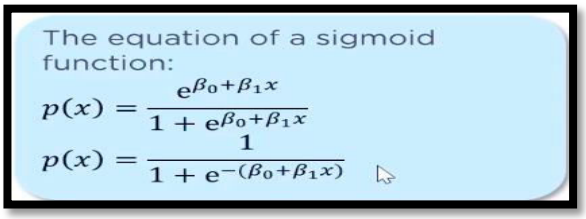

Figure.5. formula for sigmoid function.

Logistic regression model is designed to display train accuracy as well as test accuracy then hyper-plane parameter and finally the mean accuracy. And at last the performance accuracy of logistic regression will be compared manually and result will be identified.

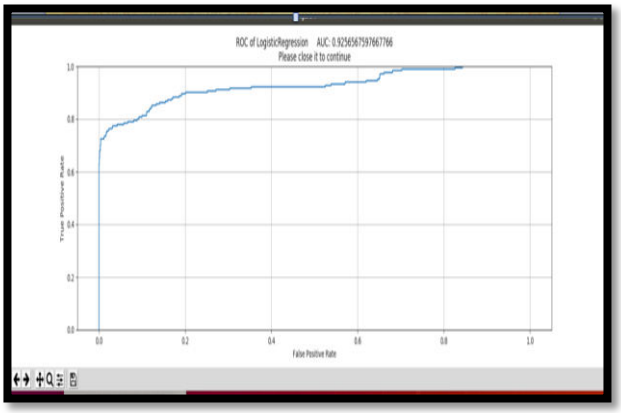

Figure.6. ROC-curve for Logistic Regression.

The training results for the KNN and logistic regression are 98.5% and 97.5% and testing result for SVM and Logistic Regression are 96.7% and 96.4%.

VI. BLOCK DIAGRAM:

Basic architecture of our project are pre-alarming of the abnormal events to which abnormal behavior database are connected to it and secondly intelligent storage of the specific part of the video and finally the retrieval of the video to which external smart camera is connect.

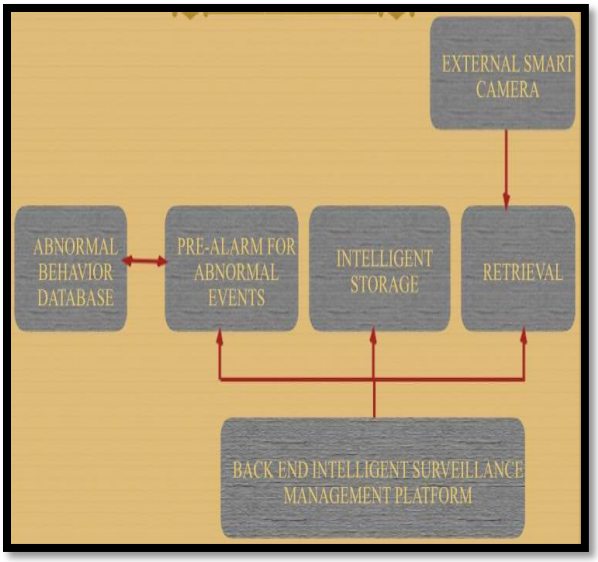

Figure.7. Basic architecture.

In which all the three basic segments are connected to the back end surveillance management platform, which is a processor.

SMART STORING OF SURVEILLANCE VIDEO:

The demand for smart storage and retrieval is becoming a huge challenge in the Big Data era. And also a system cannot store a huge length of data for longer period of time so for that we have to extract the specific content and store them separately by this way storage space will be managed and also the content of the video will be available for a longer time. The construction of the abnormal database will be done by producing the risk value. Risk value R can be calculated as follows:

$$R = \sum_{i=1}^{N} w_i n_i$$

Where w_i is the risk weight corresponding to abnormal behaviour i, n is the frequency of suspicious event and N is the total no of suspicious behaviour.

VII. RAPID RETRIEVAL OF SUSPICIOUS EVENT:

Fast retrievalis one of the basic feature for reducing the time consumption and we have modeled our system in such a way that retrieval will be done using the key words and also key words will be given through the query and after processing the query the particular video set will be able to retrieved by the concerned user. The major function of the abnormal behavior database is given bellow:

Statistics: Analyzing of the abnormal video.In this paper we have shown the location statistics, time statistics with respect to the events. By comparing the time and location of the events it makes easier to solve any criminal case.

Retrieval: As we mentioned before retrieval is very important in the Big Data application. Retrieval under types of behavior, sites or time, and show retrieval image outcome along with time and site of the event.

Analytics: Cluster the spatial and temporal attributes of abnormal behavior, draw a security surface map, and visualize the level of risk by geographical information.

VIII. CONCLUSION:

In contrast to the traditional video surveillance system, the proposed solution contributes to make full use of detected and alarmed events by smart monitoring cameras, which thus effectively improves the performance of intelligent surveillance system, promotes the ability to danger per-alarming, and greatly saves the storage space for surveillance video data. Meanwhile, the surveillance video data relevant to specific cases will be scaled down, which will greatly improve the efficiency for discovering valuable investigation clues. Several practical cases demonstrate that our approach outperforms the existing solutions.

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