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Intelligent Video Surveillance System using Deep Learning

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Abstract- Abnormal activity detection plays a very important role in surveillance applications. To capture the abnormal activity of humans without the intervention of the system i.e. automatically captures the video can be implemented. Human fall detection, suddenly jumping down which has an important application in the field of safety and security. Proposed system use for detecting roadside human activities or behavior by using the Probabilistic Neural Network (PNN) method for classifying activities or behavior between training dataset and testing videos. The partitions between classes of normal activities have also been learned using multi-PNNs. recognizing human activity has become a trend in smart surveillance that contains several challenges, such as performing effective detection of huge video data streams, while maintaining low computational complexity. Current activity recognition techniques are using convolutional neural network (CNN) model with computationally complex classifiers, creating hurdles in obtaining quick responses for abnormal activity, so this paper proposes a framework for activity detection. First, we detect abnormal activity with humans in the surveillance stream using an effective CNN model. The detected individual is tracked throughout the video stream via an ultra –fast object tracker called 'minimum output sum of squared error' {MOSSE), Next, for each

Tracked individual, pyramidal convolutional features are extracted from two consecutive frames using the efficient LiteFlowNet CNN. Finally, a novel deep skip connection gated recurrent unit is trained to learn different temporal changes in the sequence of frames for activity recognition and detection. We finish by the result indicate the efficiency of the proposed technique.

Keywords: Recognition, Video cameras, surveillance systems.

I. INTRODUCTION

During these recent years, applications of video surveillance have attracted more and more researchers. Consequently, various types of modeling, as well as several techniques of analysis and detection of human activities, are suggested. Particularly, many pieces of research are involved in the recognition and detection of human activities in general and especially abnormal activities. One important application is the supervision of elderly and disabled people at home in care centers, or hospitals. Recognition of human activities is a recent field that is interested to provide techniques and methods allowing the detection and classification of human activities, and extended now to recognize normal or abnormal activities. The motivation behind the latter is to provide an immediate intervention to preserve the lives of individuals or to ensure them some services they are unable to do by themselves. Being recent and interesting, this field has attracted the attention of several researchers who try to find solutions to the problems faced in studying such types of activities. However, the proposals made for this until now are those used for the recognition of normal human activities with minor modifications. These proposals are still very restricted because of the very limited number of works and surveys in this field. Moreover, they are not efficient and suffer from several limitations and technical difficulties. To this end, we propose in this paper an overview and an analysis of the existing works, to offer the researchers a general view of what exists in this field and to provide them with a tool being a help to them propose new approaches. For this, the manuscript is organized as follows. In the second section, we present a definition of the abnormal activities, their various types, as well as some examples of abnormal activities of a group or a single person. We then discuss in the third section the motivations that led to the advent of this research axis and the development of techniques allowing the analysis and recognition of human activities in general and abnormal activities in particular. The fourth section is devoted to the proposed approaches in the literature for the detection of abnormal activities. In this section, we present for each proposal, the purpose for which it is set up, its different stages, and the means used for its validation. Subsequently, we discuss some aspects affecting or influencing the effectiveness and credibility of the classification of human activities. The sixth section presents the three modes of automatic learning (supervised, unsupervised, and semi-supervised). Thereafter, we enumerate the encountered limitations to be taken into consideration to improve the systems of recognition and identification of abnormal activities. Finally, we finish with a conclusion where we summarize our study.

II. RELATED WORK

This paper is much work on abnormal behavior detection took a supervised learning approach. Diverse contributions have been made in the development of behavior recognizers for smart building surveillance applications. In automatic roaders, human surveillance, the vehicle or human activities and behaviors are detected and

recognized for monitoring and warning purposes, for detecting human behavior.

Types of an anomaly to detect object or behavior some are as follows:

1. Video-based abnormal human behavior recognition

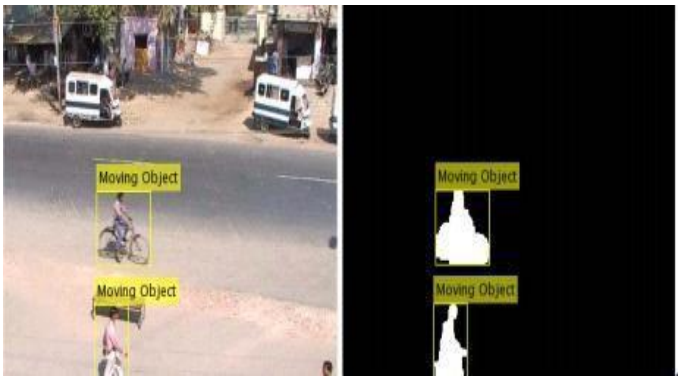


Fig. 1 Example of difference from walking or jogging

This technique only focuses on updating anomalous human activity detection. The hidden Markov Model (HMM) and Dynamic Bayesian Network Model (DBNM) [1] are using to detect suspicious behavior as shown in Fig. 1

2. Motion detection, tracking, and classification for automated video surveillance

Fig. 2. Tracking of moving object

III. EXISTING SYSTEM

- In the existing system, the video surveillance system is designed for human operators to observe protected
- Space or to record video data for further detection.
- But watching surveillance video is a labor-intensive need to be controlled.
- It is also a very tedious and time-consuming job and human observers can easily lose attention.

IV. PROPOSED SYSTEM

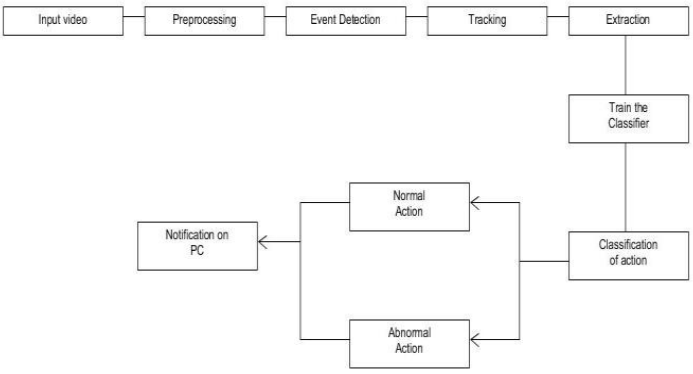
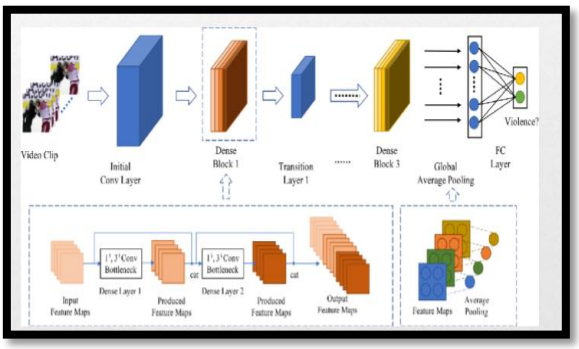


Fig 3. The proposed activity recognition framework for surveillance applications

V. ARCHITECTURE DIAGRAM



1. Capturing video

OpenCV is an open-source python library that contains various functions for image and video operations. With OpenCV, we can capture a video from the camera. cv2.VideoCapture () method is defined to get a video capture object for camera. Create an infinite loop and use the read () method to read the frames using above created object. Cv2.imshow () method is used to show the frames in the video. Loop will break when the user clicks a specific key.

2. Motion detection

In the proposed work, Motion detection is performed by using OpenCV and Pandas library. Captured videos are treated as a stack of pictures called frames. Different frames are compared to the static frame which has no movements. We compared two images by comparing the intensity value of each pixel. Firstly, we convert a color image into a grayscale image, then a gray-scale image is converted to GuassianBlur so that change can be easily found. After that difference between the static background and the current frame is found out. If we found to change between them is greater than 30 it will show white color. Then contour of the moving object.

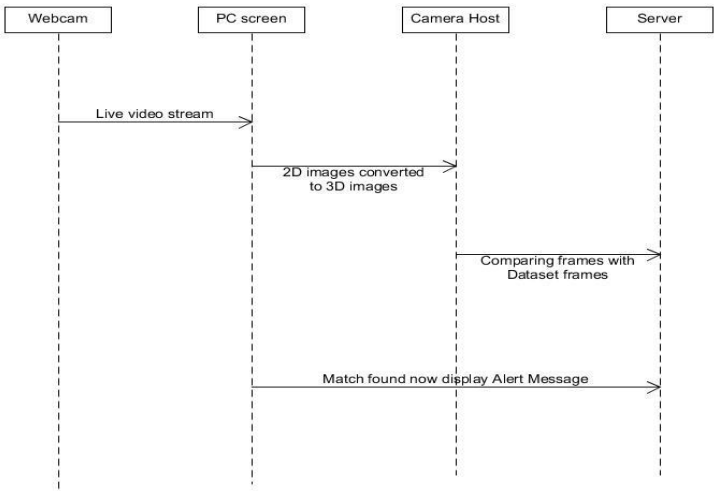
3. Feature extraction

Feature extraction is the process of identifying the important features of the data. It reduces an initial set of raw data to more manageable groups for processing. So here, we will start with reading colored images, using the imread () method. Using the shape function, the shape of the image is found out. Suppose the shape for the image is 375*500. So the number of features will be 187500. If you want to change the shape of the image that is also can be done by using reshape function from NumPy where we specify the dimension of the image. For this scenario, the image has a dimension (375, 500, and 3). This three represent the RGB value as well as the number of channels. Now we will use the previous method to create the features. The total number of features will be for this case 375*500*3 = 562500. This colored image has a 3D matrix of dimension (375*500 * 3) where 375 denotes the height, 500 stands for the width and 3 is the number of channels. To get the average pixel values for the image, we will use a *for* a loop. Now we will make a new matrix that will have the same height and width but only 1 channel. To convert the matrix into a 1D array we will use the Numpy library. CT is found out.

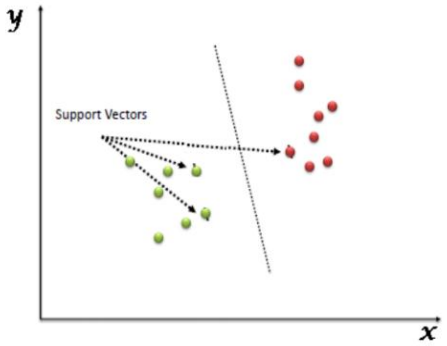
4. Classifier

An important step for surveillance activity recognition is to detect, localize, and track each individual throughout the video stream. This task is not feasible with object detectors that are trained on general categories of data. For this purpose, we fine-tuned a lightweight CNN model for human detection with new data and enabled it to work in a changing surveillance environment. It is superior to state-of-the-art methods, its effectiveness is verified from experiment. This architecture makes our system able to achieve LSTM-level accuracy while being more efficient than the LSTM.

VI. SEQUENCE DIAGRAM



VII. SUPPORT VECTOR MACHINE (SVM)



- R-transform is used to extract periodic, scale & translation invariant features.
- Different algorithms are used as a non-linear technique to overcome the similarities among different classes of activities.
- SVM (Support Vector Machine) Algorithm is used for training & recognition of activities due to its suitability for time dependent sequential data in this research.

VIII. RESULTS

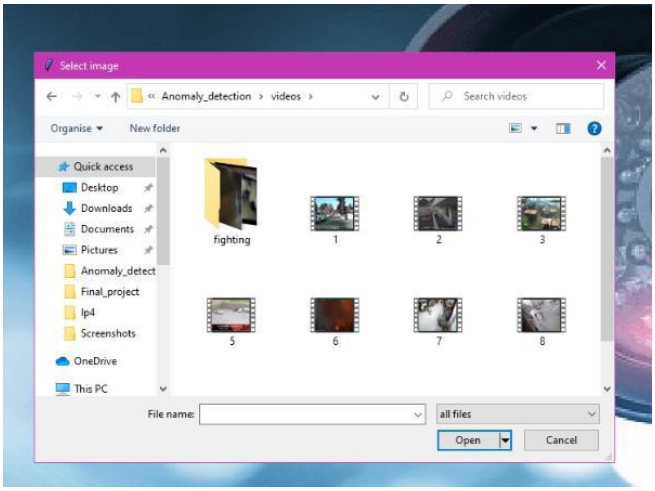


Fig: Input for Abnormal Activity Detection

- From here we'll take the file as an input for detection.

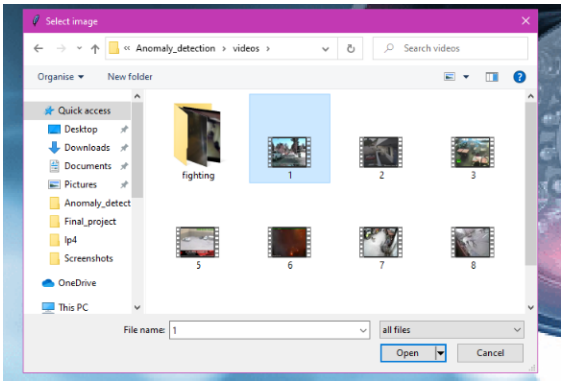


Fig: Input file for detecting abnormal activity

- Here we can choose any video stream for detection process.

We need to click on open to open the file.

Fig: Output of Abnormal Detection

Fig: Output shows as a normal activity

- After opening video, system will start processing on that video to detect abnormal activity, it will show result as an abnormal activity through that video.
- Whenever abnormal activity happen, system will detect that activity and label it as 'abnormal'.
- If there is no abnormal activity detected then it will label as 'Normal'.

IX. APPLICATIONS

Traffic Monitoring

The system will provide an easy way to monitor the traffic and give the appropriate result.

Parking Lots

The system will help in parking lots for security purposes also, visible security cameras will help you detect thieves from breaking into cars.

Security

This system will help in the security field on various platforms like parking lots, home security.

Monitoring Operations

The system will make it easy to monitor the various abnormal activities and suspicious events.

X. TABLE

Threat	Vulnerability	Asset	Impact	Control Recommendations
System Failure Overheating in server room.	Air conditioning system is old.	Server.	All service will be unavailable for at least 2-3 hours.	Setup new air conditioner.
Malicious Human DDOS Attack.	Firewall is not configured properly.	Server.	Resources will be unavailable or not work properly.	Monitor & configure the firewall.
Accidental or purposely attack of human.	CCTV doesn't have secured shield or cover.	CCTV.	CCTV will get damaged.	Setup shield or proper covering the CCTV.
Accuracy.	Low performance of algorithm or training dataset.	Server.	It will show result with low accuracy.	Monitor & reset working of functions.

XI. CONCLUSION

The proposed system aims to open a new door in the field of video surveillance and provide the result on the basis to detect abnormal activities. It will help the user to monitor any abnormal activities or suspicious events. It's been very difficult to monitor abnormal activities in various fields like security, crime prevention, traffic monitoring. It will help the user by sending an alert message when an abnormal condition is identified. The number of parameters currently included is an attempt to cover all the basic aspects of video surveillance and other overlooked parameters which deserve recognition. This work is interested in the recognition of abnormal human activities by providing a brief analysis of the recent research tasks in this field of video surveillance. We have implemented the CNN to detect abnormal activities. Finally, through this analysis of the recent research tasks in this field of video surveillance and provide the result on the basis to detect abnormal activities.

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