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Crime Scene Detection in Video Surveillance

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Article Info
Volume 83
Page Number: 4309-4313
Publication Issue:
May - June 2020

Article History
Article Received:*19 November 2019*
Revised: *27 January 2020*
Accepted: *24 February 2020*
Publication: *12 May 2020*

Abstract

Among the real-time applications that are present, one of the challenging task is the tracking of the target in low resolution video as there will be loss of discriminatory information in the visual appearance of the objects that are moving. Approaches that are already existing are mostly based on the development of a LR (low resolution) video along with the high resolution techniques. But they are the methods that require high costs for competition and this cost will continue to rise while dealing with more events. So through this paper an algorithm is introduced that can detect unusual event without making the type of conversions as above and is most suitable for the development of security systems for ATM where standard low-speed camera is used as they are of low cost.

Keywords**:** *ATMs*

1. Introduction

Over the last few decagons, consequential attempts have been made in the field of tracking of the objects and to make the programs more authentic, efficient such as video surveillance, robots, media production, biomedical research but these face many obstacles which impose constraints on the optimization of applications. The challenges incorporated are such as light change, dynamic backgrounds, secrecy, fertility, dignity etc. The above issues became even more complicated when object tracking is performed in a low resolution video. In low resolution video it is challenging to find exactly what you like because many discriminatory information such as optic symbols and primitives are not found which doesn't lead to accurate tracking of the item and resulting in malfunctioning event detection. But using low resolution video has some advantages such as requiring low cache, time of transmission and time of performance. This paper presents an algorithm capable of detecting an unusual event in ATM using low resolution video. The general use of preferred method is to improve ATM security without replacing the standard low resolution camera [1]. The method uses a standard background removal technique to separate the front part of an object from a dynamic background and morphological functionality to the appropriate design element which does not require any classifier and training dataset [3]. It uses the standard deviation of the mathematical property to determine whether this event has occurred. The ATM has shown to be a main advancement in technology which has let everyone to withdraw the cash 24x7 very easily. As ATMs are readily available as storage facilities, ATMs are often selected by frauds and thieves to steal the cash held at ATMs [4]. The program is practical step that ensures people's safety and avoid physical aggression by forecasting ATM risk. The three ATM security concerns are Acquisition of helmet, Number of acquisitions and Tools (hammer, knife etc.)

1.1 Objectives

The main purpose of the proposed paper is to design an automatic ATM security system for available event detection and alert system to reduce bank costs. To create an user friendly ATM environment. This paper aims to detect unusual events from test videos. All videos were shot using a single static camera. One example of such an event would be the sight of incidents where the car violates traffic laws. Is it possible to dynamically see and detect illegal events in video viewing in real time when strange events speed up, direct and things out of place [9]. This paper aims to detect unusual events from test videos. All videos were shot using a single static camera. One example of such an event would be the sight of incidents where the car violates traffic laws [14].

2. Literature Survey

The paper presents algorithm that can detect unusual activities such as overcrowding, fights etc. in an ATM room. It uses conventional low resolution cameras and

hence it is cost effective but it does not detect uncommon events like stealing of ATM [1]. Paper proposes enhanced ATM security by using the various methods and algorithms and if there is any unusual event detected an alert message is sent [2].It provides security by designing and implementation of face detection and uses background subtraction technique to extract or detect the object in the foreground [3]. The system is able to detect the presence of abnormal incidents such as face covering by helmet, fights or overcrowding in low resolution video by means of standard deviation. It is adequate as it processes low-resolution structures and sends awareness messages to the authorities involved in investigating (targeting) the system to improve ATM security and theft prevention using a standard low-maintenance camera.[1][6]

3. Methodology

3.1 Proposed System

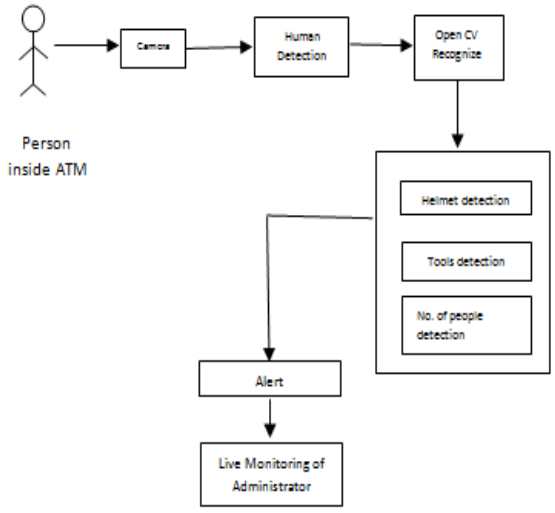

Figure 3.1: Architecture diagram

We propose a system capable of processing online watching and online video surveys to find suspicious objects based on human behavior. We use semantic information to find out the suspicions of a single person like wearing a helmet and behaving as many people like to go together, fighting in a team with tools like a hammer or knife. We use an Internet-based monitor to cameras to monitor activities, Once any suspicious behavior of a person or any helmet or similar equipment is discovered it will produce a notice at once for all suspicious activity Proposed system has three modules:

- Helmet Detection
- Tools Detection
- Number of people Detection

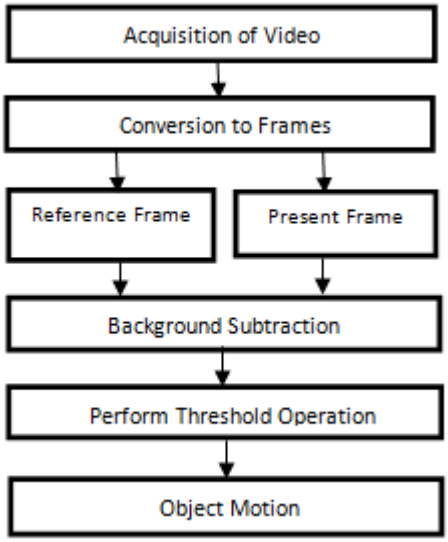

Figure 3.2: Flow Chart of Background Subtraction Method

Acquisition of Video: Here video in obtained through any other video capture gadgets such as Handy cam, mobile camera, CCTV camera etc.

Frame conversion: After the video is captured, next step is to convert to the appropriate frames so that additional processing can be performed correctly.

Background Layout: After adjusting the background model is used to create the appropriate layer (fixed or variable) according to the environment variables. This is a vitalstep which can sometimes comprise the task of image removal. They are descriptive features of any background removal program.

Threshold Operation: Most of the removal process happens here. Here anyimportant change to the image region from the background model are recognized and the pixels that make up the transition regions are noted for further processing. Generally, the linked part with an algorithm label is used to find the connected regions that correspond to an object.

Front frame: It is the final step where moving object of the frame is removed and thethis step helps in judging the efficiency of the background removal program.

Pre-Processing: The pre-handling step incorporates bringing in the video casings and making it ready for preparing. It likewise includes feature extraction which is the contribution to the training algorithm. At first the video is changed over to frames. Every video will create a lot of casings which roughly means the quantity of seconds. This procedure of changing over video to frames utilizing python libraries. The edges acquired are then dissected in ventures of 5 frames at any given time. So 5 back to back frames are taken at once and every one of the edges are resized to various levels of resolutions. From test result 3 scales are picked, one with 20x20 resolution, 30x40 resolution and 120x160 resolution.

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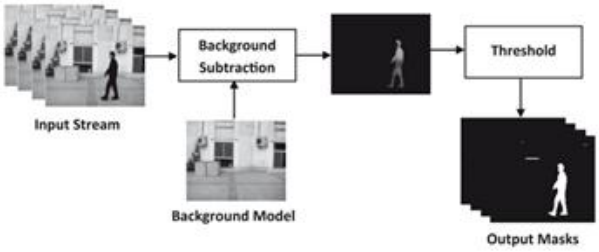

Figure 3.3: Sample image of Background Subtraction

OpenCV: Computer vision problems are solved by OpenCV which supports various types of input languages such as C ++, Python, Java and platforms like Windows, Linux, and MacOS. By using this OpenCV member structures are converted to NumPy arrays by making it easy for integrating with other libraries that make use of NumPy such as SciPy and Matplotlib.

3.2 Algorithms

Gaussian blur algorithm: This algorithm alone will blur the edges and reduce the difference. It helps with the test system of ATM security while using the basic low-resolution cameras. It works fast as it processes low resolution frames.

$$G(x,y)=(1/2\pi\sigma^2) * (e^{-(x^2+y^2)/2(\sigma^2)})$$

(1)

x = distance from the origin in the horizontal axis

y = distance from the origin in the vertical axis

σ = standard deviation of the Gaussian distribution

Haar Cascade Algorithm: Haar Cascade is a machine learning object detection algorithm used to identify objects in an image based on the concept of features .Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it.

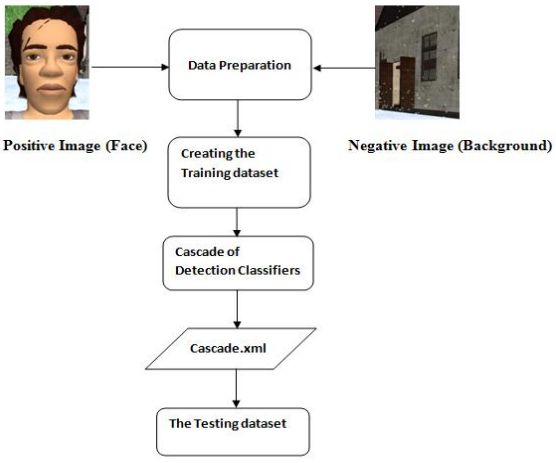

Figure 3.4: Flowchart of Haar training

Convolutional Neural Network (Conv Net/CNN): is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.To obtain (correct) predictions from deep neural networks we first need to pre-process our data .

3.3 Frame work

TensorFlow: TensorFlow is a Python library to create a frame work to create code and develop applications. It was created and released by Google. TensorFlow that makes it easy to construct, train and deploy object detection models.

YOLO (Only You 'Look' Once): Yolo is an algorithm that uses neural networks to allow object detection. Although it is not an algorithm for finding the right thing, but it is a very good decision when we need to get real-time, without losing too much accuracy.

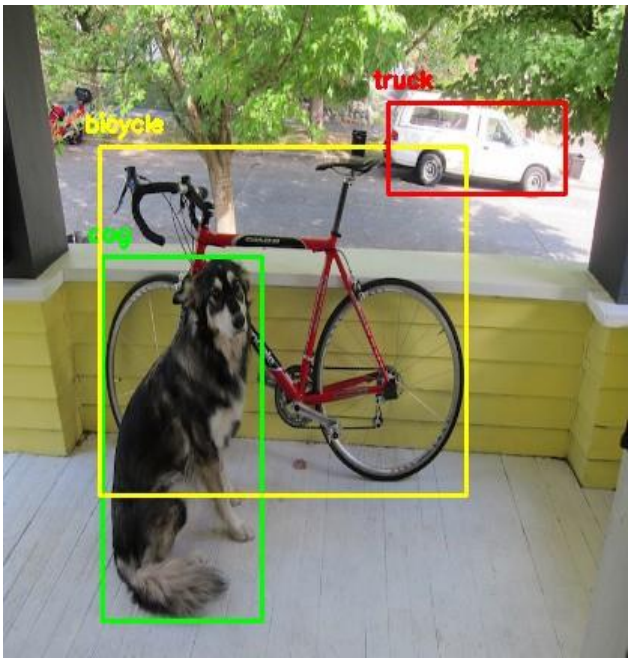

Figure 3.5: Sample image of YOLO object detection

4. Results

• This paper aims to detect unusual events in surveillance videos shot using a single-camera camera. We have proposed an algorithm where it does not use any modification of high resolution techniques:

➢ When a person gets inside ATM with any kind of tools (like hammer, knife) this is considered as unusual event and hence detected

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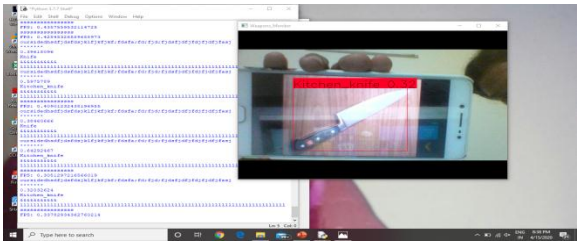

Figure 4.1: Knife Detection

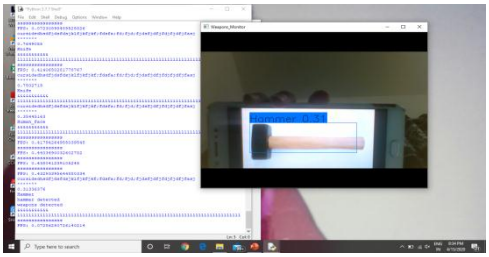

Figure 4.2: Hammer Detection

➢ If ATM is crowded inside, the number of people inside it is detected.

Figure 4.3: Number of people detection

➢ If a person is carrying a helmet inside ATM, this will be considered as unusual event and hence detected.

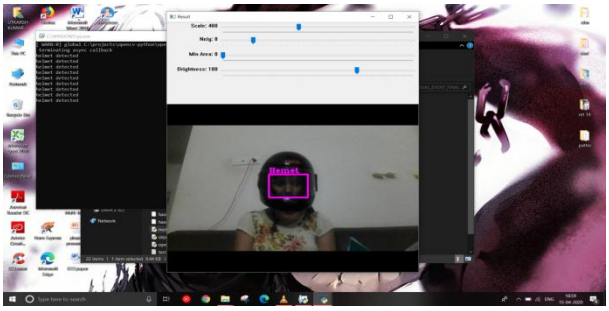

Figure 4.4: Helmet Detection

5. Conclusion

Through this paper, we conclude that there is increasing demand for systems that can identify unusual events automatically as there is large use of surveillance cameras in different fields of life. Violent action detection in computer vision has become a booming subject that interest new researchers. The state of art research is explored by this systematic review in the violence detection system. This systematic review provides the details of techniques using CNN and classification based on violence detection in traditional machine learning. These datasets and video features which are used play an important role in the process of recognition in all methods. Object detection methods, features extraction and classification as well as dataset are being used to define the accuracy. We here by conclude that the techniques or the methods used for "unusual activity detection in video surveillance" is potentially highlighted in our study.

Acknowledgement

I am very grateful to my university, REVA University, for providing me the opportunity and all the facilities required for successfully completing paper on the literature for "Crime Scene Detection in Video Surveillance" and also providing me all the necessary guidelines. I also show my gratitude to my guide Dr. Venkatesh Prasad, School of C&IT,RU, for his valuable guidance.

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