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Technical Seminar Synopsis on

WEAPON DETECTION IN CCTV IMAGES USING DEEP LEARNING

Submitted By

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INTRODUCTION

1.1 Overview

Levels of gun-related violence vary greatly among geographical locations and countries. The global death toll from use of guns may be as high as 1,000 dead each day. From street crimes to an individual institution attack, many precious lives suffered. This further indicates that manual surveillance system still needs human eye to detect the abnormal activities and it takes a sufficient amount of time reporting to security officials to tackle the situation.

Object classification is one of the main tasks to perform in computer vision.

- Object classification main goal is to predict the class of an image from the given image
- The main aim of object classification is to identify the features of an image with more accuracy.
- Object classification combines object localization and object detection to classify objects in an image or video.

Object localization is to locate the objects. Object detection is used to detect the details of an object in an image. Encoding objects play a vital role in computer vision technology. One of the most widely used features of object classification is a color histogram and scale-invariant feature transform.

Object detection is the process of locating an object from an image or video with the help of computers and software. Deep learning is a part of the artificial neural network, which helps understand the system on its own. Deep Neural Network (DNN) is one of the machine learning techniques used in object detection and classification. DNN helps to identify the objects without any hand designs features. For tasks like object recognition, DNN models perform at a human-equivalent level.

1.2 Objectives

- DNN based regression is used in object detection to detect low-resolution images and helps to capture detailed information about the objects.
- A convolutional neural network (CNN) is a deep learning technique used to detect objects from an image and analyze the visual imagery of an image.

- CNN uses a pooling layer to reduce the size of the pixels and helps to find maintain the patch of the pixels.
- Support Vector Machine (SVM) is used to classify objects in an image or video.

LITERATURE REVIEW

[1]Muhammad Tahir Bhatti, Muhammad Gufran Khan, Masood Aslam and Muhammad Junaid Fiaz proposed a new approach to detect illegal activities based on binary classification (BC) with deep learning (DL) approach. This is mainly used to detect harmful weapons in real-time surveillance cameras by implementing a deep learning algorithm. Compared with the existing model, the proposed method has high accuracy in detecting weapons.

[2]Mai K. Galab, Ahmed Taha, Hala H. Zayed proposed an automated knife detection approach based on a deep learning algorithm to enhance the frame's brightness in surveillance coverage areas. By enhancing the brightness of the frames, detecting knives will be increased efficiently. Experimental results increase the performance efficiency in detecting the weapons compared with the existing model. Using hazard detection techniques, video or image captures of natural disasters can locate victims and damaged objects.

[3]Alexander Egiazarov, Vasileios Mavroeidis, Fabio Massimo Zennaro, Kamer Vishie tackle the problem of detecting the presence of weapons within an image. They cast this problem as image detection/segmentation supervised learning problem: They want to learn a function that given an image as input returns the presence and the location of the weapon. Following the state of the art, They decided to use convolutional neural networks to learn such a function.

[4]Lei Pang, Hui Liu, Yang Chen and Jungang Miao proposed real-time concealed various object detection under human dress in Metallic guns on human skeleton were used for passive millimeter wave imagery which relies on YOLO algorithm on dataset of small scale. Subsequently, comparison is undertaken between Single MultiBox Detector algorithm,

YOLOv3-13, SSD-VGG16, and YOLOv3-53 on PMMW dataset. Moreover, the weapon detection accuracy computed 36 frames per second of detection speed and 95% mean average precision.

[5]Jesus Ruiz-Santaqueteria, Alberto Velasco-Mata, Noelia Vallez, Gloria Bueno, Juan A. Álvarez-G, and Oscarcia R Deniz proposed a method to detect handguns by analyzing the poses of humans in public places. This method uses grayscale images to detect handguns, and the proposed method improves the efficiency of handgun detection. For the detection of threats or dangerous objects such as firearms, most of the proposed methods are based only on the visual appearance of the objects, without taking into account the human pose or another additional information.

[6]Seyed Mehdi Mohtavipour, Mahmoud Saeidi, Abouzar Arabsorkhi proposed a new method named deep violence detection framework using handcrafted features based on a deep learning approach. The proposed deep violence detection method is more accurate in detecting violent activities, and time consumption is reduced compared with the state-of-the-art algorithm. d for feature extraction and data classification, respectively. DMOF and DMEI were two novel discriminative features that trained well the CNN network to predict all input frames of datasets. The experimental results showed that violence detection accuracy is obtained approximately 100% for both crowded and uncrowded environments.

[7]Jesus Salido 1, Vanesa Lomas, Jesus Ruiz-Santaquiteria and Oscar Deniz proposed how including body pose information (skeleton keypoints and limbs retrieved by a pose detector) in the input images, as a preprocessing step, can improve the handgun detection performance.

[8]Jaeseo Park, Junho Heo, Suk-Ju Kang proposed an object detection based on the estimation of multi-person poses. This method improves the performance of the overall service. Key point estimators and object detectors are widely used in real-time expert systems by analyzing multi-person poses. The proposed method is high in performance rate and accuracy rate of detecting an object compared with the state-of-the-art model

[9]Jose L. Salazar González a, Carlos Zaccaro a, Juan A. Álvarez-García a, Luis M. Soria Morillo a, Fernando Sancho Caparrini work was very much related to achieve real-time results. They did immense experimentation using different datasets and trained Faster–RCNN using

Feature Pyramid Network with Resnet50 and improves the previous state of the art by 3.91 %.

LIMITATIONS OF EXISTING SYSTEM

As with most imaging, we confront the problems of noise and resolution limitation in CWD imaging. Each sensor type brings its own type of problem. For example, IR imaging depends on differentiating the concealed weapon from its surroundings through temperature differentials; the weapon is colder than the body. However, if the concealed weapon has been carried for a long time, a significant temperature differential may not exist. Thicker clothing also masks temperature differentials. The result is that the object of interest appears diffused and with low contrast. Objects in the clothing and even parts of the body create clutter in the images regardless of sensor type.

PROPOSED SYSTEM

A method using CNN Attuned Object Detection Scheme (AODS) is initiated for harmful object detection from CCTV inputs. The feature-constraint-based analysis extracts the feature of monitoring images and identifies the objects in that region. This work proposes the variation in dimensional feature representation and prevents multi-object errors.

The proposed AODS method detects the dangerous objects in the CCTV footage. CCTV works under the conditions of capturing a constant sequence of images n transmitted over fiber cable or wirelessly to the recording equipment and then on to the monitor, which is independent of seeing the consequent images as video footage. To preserve information in original data set, feature extraction involves converting raw data into numerical features that can be processed. Compared to using machine learning directly on raw data, this method produces superior result

ARCHITECTURE

This detection scheme describes the object identification pursued in the proposed scheme. It identifies Objects and classification using CCTV camera inputs.

This proposed work aims to obtain CNN by utilizing a feature-constraint-based analysis. Further improvement was achieved using our model, increasing the F1 score 1(c), precision 1(b) and metric accuracy 1(a) of the images.

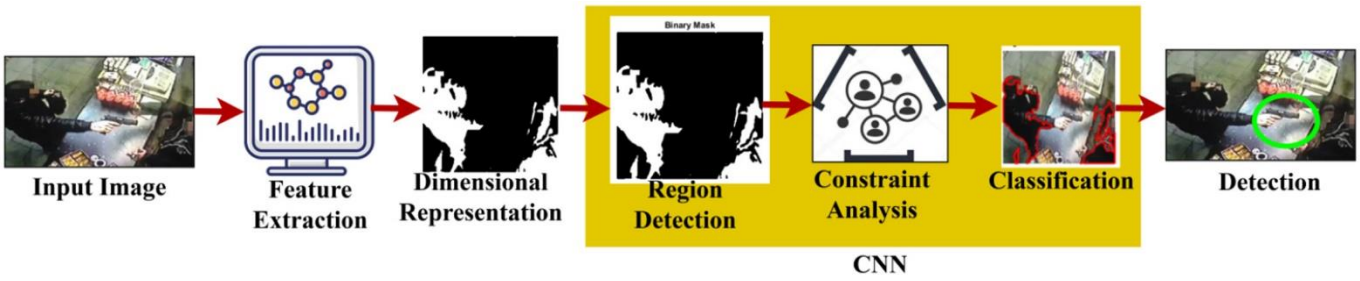

Fig 1: Implementation Overview

METHODOLOGIES

A. Attuned Object Detection Scheme (AODS)

A method using CNN Attuned Object Detection Scheme (AODS) is initiated for harmful object detection from CCTV inputs. The feature-constraint-based analysis extracts the feature of monitoring images and identifies the objects in that region. To avoid multi-object errors, we present the idea of changing how dimensional features are represented. One could try a naive approach to solving this problem by using a CNN to classify the presence of an object in different regions of interest in a photograph. This method has some drawbacks because of the possibility of different aspect ratios and spatial distributions within the image.

B. Convolutional Neural Networks

A Convolutional Neural Network (ConvNet/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. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNet have the ability to learn these filters/characteristics.

The architecture of a ConvNet is analogous to that of the connectivity pattern of Neurons in the Human Brain and was inspired by the organization of the Visual Cortex. Individual neurons respond to stimuli only in a restricted region of the visual field known as the Receptive Field. A collection of such fields overlap to cover the entire visual area.

APPLICATIONS

- Easy detection of Concealed weapons in public places.
- Reducing the cases of gun violence in public places with the help of smart-surveillance system.
- Easily detect pistols, long weapons in running video frame and reduces the dependency and manpower required for it.
- Due to continuous eyes on screen, it may lead to sluggishness and human errors, which can be reduced drastically with this system.

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