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WEAPON DETECTION AND ALERT SYSTEM IN ATM'S USING DEEP LEARNING TECHNIQUE TO AVOID CRIMES THIEF

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Abstract: In weapon detection the Security remains a paramount concern across various domains, especially with the escalating crime rates in densely populated events or secluded areas. Leveraging computer vision for abnormal detection and monitoring presents significant applications in addressing numerous challenges. Given the increasing demand for safeguarding safety, security, and personal assets, the implementation and deployment of video surveillance systems capable of recognizing and interpreting scenes and anomalous events play a pivotal role in intelligence monitoring. This project proposes an automatic gun detection system using a YOLO (You Only Look Once) convolutional neural network (CNN)-based algorithm. The trained model exhibits the capability to detect guns based on a pre-trained YOLO file, triggering alerts via a buzzer and notifying preset authorized users or police stations. In addition, in the event of a threat, the victim can activate an emergency alert by pressing a button and vocally requesting assistance. This voice prompt is recognized, prompting an immediate alert with the captured scene for swift response.

I. INTRODUCTION

Gun violence poses a significant threat to human rights and freedom worldwide, instilling fear and insecurity in communities. The pervasive presence of firearms contributes to a staggering number of deaths globally, with statistics indicating approximately 500 fatalities daily attributed to gun-related violence. Shockingly, over 44% of homicides involve firearms, underscoring the urgent need for effective measures to address this pressing issue. Between 2012 and 2016, over 1.4 million deaths were recorded due to firearms violence, highlighting the magnitude of the problem. Anomaly detection is crucial for identifying irregular or unexpected events that deviate from established patterns within datasets. An anomaly, in this context, refers to a pattern or item that differs significantly from standard occurrences.

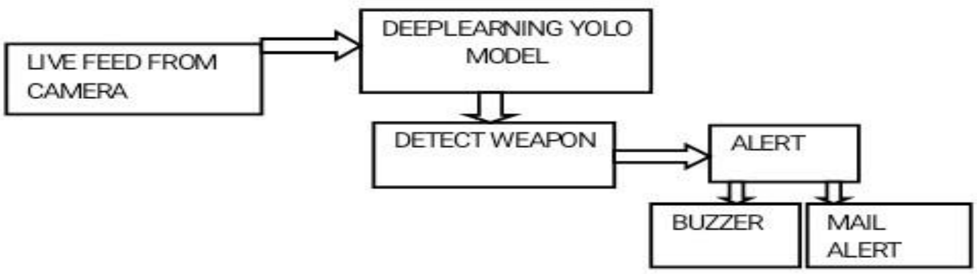

Fig. 1 : Architecture

The effectiveness of anomaly detection hinges on the specific phenomenon under security, with anomalies representing deviations from normal behaviour or occurrences. Object detection employs feature extraction and learning algorithms to identify instances of various objects within a given dataset. In this proposed implementation, the primary focus is on accurate gun detection and classification, with paramount concern for precision to minimize false alarms and mitigate adverse responses.

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Striking the right balance between accuracy and speed is essential, necessitating careful consideration in approach selection. The implementation involves extracting frames from input videos, applying frame differencing algorithms, and creating bounding boxes to facilitate object detection.

II. ALGORITHM

The RCNN algorithm is intended for real-time object detection. It shortens the process by removing the requirement for a regional proposal network. The RCNN detection algorithm is includes of 2 parts:

1. Create a feature map
2. Detect objects using filters.

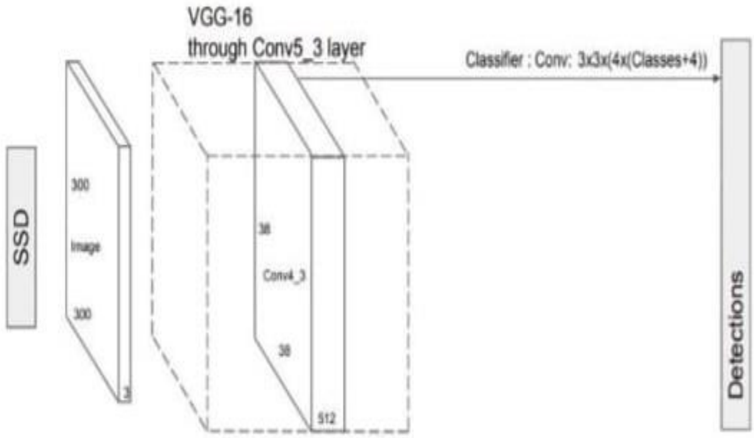

Fig. 2: Convolution Layer

RCNN uses VGG16 for feature extraction. After that, the Conv4 3 layer is utilised to detect objects. We'll make the Conv4 3 radially 8 8 as an example (it should be 38 38). For each cell, it offers four image estimations (also known as location). Each estimate has a boundary box and 21 scores for every class (one extra class for no object), and the bounded item's class is determined by the class with the highest score. Independent of the depth of the feature maps, Conv4 3 makes a total of 38 38 4 predictions: four predictions per cell. Many predictions, as expected, have no object. The class "0" is reserved by RCNN to signify that it would have no entity.

III. EXISTING SYSTEM

With the rise in criminal activities targeting these vital financial hubs, the integration of sophisticated weapon detection and alert systems becomes imperative.This paper explores the existing technologies in weapon detection and alert systems within ATMs, focusing on the innovative application of deep learning algorithms to preempt and mitigate criminal activities, ultimately safeguarding both users and financial institutions. Here are some aspects of older existing systems:

- Airport Security Scanners: Airport security systems often utilize advanced imaging technologies such as X-ray scanners and millimeter-wave scanners to detect weapons and prohibited items concealed on individuals or in their luggage.
- Metal Detectors: Metal detectors are commonly used in various settings, including airports, government buildings, and event venues, to detect metallic objects such as firearms, knives, and explosives.
- Gunshot Detection Systems: Gunshot detection systems use acoustic sensors to detect and locate the source of gunfire in urban areas. These systems can help law enforcement agencies respond quickly to incidents involving firearms.

IV. PROPOSED SYSTEM

A novel system integrating deep learning techniques for weapon detection and alert systems in ATM facilities is proposed. Leveraging advancements in deep learning, specifically convolutional neural networks (CNNs) and object detection algorithms, the system aims to accurately identify weapons within the vicinity of ATM machines.

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Through the deployment of strategically placed surveillance cameras, the system continuously monitors the surroundings in real-time. The CNN-based model is trained on a diverse dataset of weapon images to enable robust detection across various lighting conditions and weapon types. Upon detection of a weapon, the system triggers an immediate alert to designated authorities and initiates appropriate security protocols, such as locking down the ATM or dispatching law enforcement. Additionally, the system can be integrated with existing security infrastructure for seamless coordination and response. This proactive approach to weapon detection enhances the safety and security of ATM facilities, deterring potential threats and safeguarding customers and personnel. ulars area accessible to students for stayingupdated on campus activities and announcements

V. LITERATURE SURVEY

[1]. “Electromagnetic Imaging System for Weapon Detection and Classification”
This paper addresses the issue of identifying conductive objects based on their response to electromagnetic fields. It had demonstrated a new EM metal detector system and investigated the feasibility of visualizing the EM signal in a WTMD for object identification and classification purposes.

[2]. “Application of deep learning for weapons detection in surveillance videos”
In this research paper, Comparative analysis have been made for the two versions of the state-of-the-art object detection algorithm known as YOLOV4 and YOLOV3. We have done a fact-finding comparative analysis for a weapons detection task.

[3]. “Automated Detection of Firearms and Knives in a CCTV Image”
In this paper, we focus on the task of automated detection and recognition of dangerous situations for CCTV systems. We propose algorithms that are able to alert the human operator when a firearm or knife is visible in the image.

[4]. “Weapon Detection Using YOLO V3 for Smart Surveillance System”
In this research work, we aim to develop a smart sur- veillance security system detecting weapons specifically guns. For this purpose, we have applied few compute vision methods and deep learning for identification of a weapon from captured image.

[5]. “Detection and Classification of Different Weapon Types Using Deep Learning”
TIn this study, a new model was developed to detect and dassify seven different weapon types based on the VGGNet architecture. In addition, a new dataset consisting of seven different weapon types was constructed.

VI. PROBLEM STATEMENT

Develop an efficient and accurate weapon detection system using the YOLO (You Only Look Once) object detection algorithm. The increasing incidents of violence and security threats in public spaces necessitate the implementation of advanced technology to enhance security measures. Traditional methods for detecting weapons in public areas are often time-consuming and less effective, leading to potential risks. The goal of this project is to create a real-time weapon detection system that can swiftly and accurately identify weapons in live video streams or recorded footage. The system should be capable of detecting various types of weapons, including firearms and bladed instruments, under different lighting conditions and angles.

VII. METHODOLOGY

Developing a weapon detection and alert system using YOLO (You Only Look Once), a popular object detection algorithm, involves several steps. YOLO is known for its real-time object detection capabilities, making it suitable for applications like this. Here's a basic methodology to guide you through the process:

- **Define Object Classes:**
  - Identify and define the classes of objects you want to detect. In this case, focus on weapons.

- **Dataset Preparation:**
  - Collect and annotate a dataset containing images with weapons. Annotate the bounding boxes around the weapons in the images.

- **Data Preprocessing**:
  - Resize and normalize the images to ensure uniformity and facilitate model training.

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- **YOLO Model Selection:**

- Choose a pre-trained YOLO model suitable for your task. YOLOv3 and YOLOv4 are popular choices. You can find pre-trained weights on the official YOLO website or other repositories.

- **Model Fine-Tuning:**

- Fine-tune the selected YOLO model on your weapon dataset. This step is essential to adapt the model to your specific detection requirements.

- **Training:**

- Train the YOLO model on your annotated dataset. Adjust hyperparameters as needed. Monitor training loss and validation metrics to ensure the model is learning effectively.

- **Post-Processing:**

- Implement post-processing techniques to filter out false positives and refine the detection results.

- **Integration with Video Feed:**

- If your application involves real-time video analysis, integrate the trained YOLO model with a video feed. OpenCV is a popular library for this purpose.

- **Alert System:**

- Implement an alert system that triggers notifications or alarms when a weapon is detected. This could involve integrating with external systems, such as security cameras or alarms.
- Capture the image of any person holding weapon and send immediately to any authority email.

VIII. CONCLUSION

In this study, we focused on the two specific tasks of automated detection and recognition of dangerous situations. We have proposed, implemented and tested algorithms for the detection of a dangerous tool held in a hand. A knife or a firearm (the most frequently-used weapons in assaults) held in a person's hand is an example of a sign of danger. The specificity and sensitivity of the knife detection YOLO algorithm is 94.93% and 81.18%, respectively. These results are significantly better than others published recently. Our solution to the knife detection problem deals with poor quality and low resolution images. This is important because many CCTV systems only provide such quality of footage. It should be noted that the algorithm is processed in real time. Any knife of weapon is detected the system turn on the buzzer to alert surrounding people and also captures the scene and send it to predefined mail id as a proof for further investigation.

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