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ATM Security System Based on the Video Surveillance Using Neural Networks

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Abstract - *Since many years ago, an unexpected or uncommon event detection has been utilized to identify strange elements in the collected data. The most popular method is machine learning, which plays a significant role in this field. In this essay, we've performed a review. on research that examines the machine learning model that uses these techniques to identify uncommon events. Our review is divided into four sections: usage of unusual detection, machine learning techniques, overall model performance, and classification of odd event detection. About 170 publications from research that was published between the years 2000 and 2021 and provides information on machine learning approaches have been recognized. After analyzing some of the research articles, we present 08 data sets which are included our experiment on odd detection as well as many additional datasets. By incorporating machine learning's unsupervised odd detection method, it is made more complex. Through this study paper, we encourage more studies based on the recommendations made by this review. There are numerous other experiments that use machine learning to identify odd events.*

Key Words: **Neural Network, Security, Object detection, Yolo, Haar Cascade**

1.INTRODUCTION

For a long time, finding odd happenings was a big concern and problem. For various kinds of operations, there are numerous other ways being developed to identify odd events. The challenge of identifying patterns in data that weren't anticipated is known as unusual detection. The importance of identifying uncommon occurrences in various operational states aids in the identification of significant, sensitive, imperative, and practicable information. There is a need for automatic security warning systems in the current ATM systems, It makes it possible for users to enter the ATM safely. Even though the government and financial authorities have taken numerous measures to ensure safety, it is still costing fees for the human security system that are extra. The approach suggested here is a low-cost, real-time automatic ATM security system that is based solely on video surveillance detection. The research seeks to check for several unusual activities, such as many people entering the ATM, removing cameras from the system, even if some camera masking is done, and even detecting people entering the system while wearing a helmet. When any of these circumstances arise at the ATM, the system immediately sends a notification to the closest station and locks the ATM door.

1.1 Objective Of Research

The major goal of this system is to be proactive in ensuring public safety and preventing physical assaults by for seeing events. Traditional video surveillance systems rely too heavily on human oversight, which is exhausting and prone to mistakes. The sectors that require constant monitoring are expanding, and the danger of not spotting anomalies in time could lead to serious disasters. We were also inspired to take on this project to show how this extremely important activity can be automated and increase the efficiency of the surveillance system to alert any risks arising from the non-detection of anomalies in time as and when they occur. This id due to the advancement in the availability of sophisticated video cameras, technologies for continuous streaming of video data, and Deep learning techniques.

2. LITERATURE REVIEW

[1]Using Neural Networks, anomaly detection in videos for video surveillance applications:

Video labelers, image processing, and activity detection are the three layers that make up the entire process of anomaly detection in video surveillance. In light of real-time circumstances, anomaly detection in videos for video surveillance application provides reliable findings. Advantages include a 98.5% [1] accuracy rate at which the abnormality was found in photos and videos. The main drawback of this project is that it focuses on anomaly detection in terms of people's security

[2] ATM security system based on face detection and running on embedded Linux:

The system is put into operation using a Raspberry Pi board the size of a credit card that has expanded open-source computer vision software capabilities. Consecutive operations, like the initial system capture of the human face and check to see if the human face is detected correctly or not, give a high-level security mechanism [2]. It alerts the user to adjust himself or herself adequately to detect the face if the face is not properly detected. The system will lock the ATM cabin door if the face is still not properly detected for security reasons. The system will automatically produce a three-digit OTP code as soon as the door is locked.

[3] Smart ATM Surveillance System:

This paper describes an Automated Teller Machine (ATM) surveillance system, a smart system based on embedded technology that integrates various sensors to continuously monitor its surroundings for suspicious activities like physical attack, fraud, and theft that could endanger the ATM and people nearby [3]. The security and safety precautions that can be put in place to stop such raids through effective surveillance are also covered. This study examines the various physical assaults against ATMs and suggests ways to foresee them, take preventative action, and alert authorities via the GSM network.

[4] Detection of Unusual Events in Low Resolution Using video to improve ATM security:

Signal Processing and Integrated Networks International Conference (SPIN) An algorithm that can find odd events in low resolution video is presented in this research. Our suggested method is frequently used to increase ATM security without removing the existing poor resolution cameras. By simply using morphological operations with the appropriate structuring element, it may divide foreground objects from scenes with changing backgrounds and maintain [4] object attributes to some extent. This technique uses rolling average background subtraction. This suggested algorithm might be useful for boosting ATM security. The outcomes demonstrate that the a forementioned technique is effective when used on low resolution video. The disadvantages Could not find evidence of theft within the ATM or damage to the screen.

3. PROPOSED WORK

The proposed system can employ a USB camera with low resolution, but we have used a web camera for the prototype. Live video will be streamed from the webcam, and frames will be recorded for image processing. For our design, we are utilizing Open CV, an open-source image processing technique. Using the technique outlined below, the unexpected activity inside the ATM is detected for the proposed design. The listed approach can be improved by adding more features as needed by training our own classifiers. It is pretty straightforward.

The algorithms lead to:

1. Face recognition characteristics allow identification of the person who entered the ATM.
2. It will be seen as odd conduct if the person using the ATM has a helmet on or is wearing anything else that would obscure his face.
3. If a person remains within an ATM without engaging in any activity for a predetermined period of time, a threshold time is set, and if the person remains inside the ATM room for longer than the threshold time, an alarm message is sent to the security guard so they can keep an eye on him on screen.
4. If multiple faces are found, it is regarded as Unusual Activity. This prevents robberies from occurring within the ATM room.

Methodology:

The methodology employed in this paper is comprised of 8 phases. Before the data is saved or processed, the initial stage of the process, known as video acquisition, entails obtaining data from a variety of sources in order to capture the video using any available video capturing equipment. The second stage is frame conversion, which transforms the captured video into frames suitable for further processing. Pre-processing, which is used to reduce the noise in video frames, is the third phase. Background modeling, which develops the ideal background based on environmental changes, is the fourth phase. The foreground images are focused while background images are removed and converted to pixels for further processing in the fifth phase, known as background subtraction.at order to improve the results, post-processing is carried out at the sixth phase. The seventh and last stage, known as foreground extraction, is eliminating only the moving subject from the frame. It helps determine how effective the background subtraction is.

After finishing all these steps of unusual event identification, we use Trading view alert system to receive alert messages through SMS, Email, etc. It will send notifications to the concerned officer as well as the police station

Algorithms Used:

A. Convolution Neural Network (CNN)

A deep learning system called a convolutional neural network (CNN) is able to recognize different objects in an input image by assigning them weights and biases that can be learned. In comparison to other classification methods, it

requires significantly less setup. Convolutional layers, pooling layers, and fully connected layers make up the foundation of a CNN. To extract features from the input image, a series of learnable filters are convolved with the image in the convolutional layer. The pooling layer keeps the most crucial data while reducing the spatial size of the convolutional layer's output. The convolutional and pooling layers' outputs are fed into the fully connected layer, which creates the final result.

B.Haar Cascade Algorithm

In order to identify objects, the Haar cascade method first finds features in an image. These features are rectangular areas with edges, lines, or corners that have specific pixel values. Each classifier in the algorithm has been taught to recognise a certain characteristic. More complicated features are layered on top of simpler ones in this hierarchical framework of classifiers. A sliding window that sweeps over the full image is used to scan the image throughout the detecting phase. A score is given depending on how well the features within the window fit the patterns of the object being detected at each place after the classifiers have analyzed the features within the window. The window is labelled as containing the object if the score rises beyond a predetermined threshold.

C.Yolo

A real-time object detection technique called YOLO (You Only Look Once) combines detection and classification in a single phase. The algorithm creates a grid from the input image and forecasts bounding boxes and class probabilities for each grid cell. Once integrated across many grid cells, these predictions result in a complete set of object detections. YOLO is renowned for its accuracy and speed; it can process images at a rate of over 45 frames per second on a typical GPU and excels at handling cluttered and small-scale environments. Numerous practical uses of YOLO exist, including automated driving and video surveillance. Because YOLO has a low false positive rate, it is less likely to wrongly identify things that are not visible in the image. YOLO has several drawbacks, like the inability to recognise tiny items or those that are substantially obscured, yet it has been demonstrated to outperform other cutting-edge object detection algorithms in many situations.

D. ImageNet

Using the deep convolutional neural network architecture is what the ImageNet algorithm does. A deep neural network called AlexNet has 3 fully connected layers, 5 convolutional layers, some of which are followed by max-pooling layers, and 5 convolutional layers. It makes use of the local response normalization, dropout regularization, and rectified linear unit (ReLU) activation function. The weights of the AlexNet model are adjusted during training using the ImageNet dataset, which has approximately 14 million labelled images. The goal is to develop a system of weights that can correctly categorize photos into one of a thousand different item categories. In the 2012 ILSVRC, AlexNet was able to obtain a top-5 error rate of 15.3%, which was a notable improvement over earlier state-of-the-art technique. Since then, many additional deep neural network architectures, like as VGG, ResNet, and Inception, have been created and tested on the ImageNet dataset.

4. RESULTS

Automated Teller Machines (ATMs) are a convenient way for people to access their money and perform financial transactions. However, due to their nature of dispensing cash, they are a prime target for criminals. Therefore, ATM security is of utmost importance to ensure the safety and security of customers and their transactions. Our team has created a method that will secure the ATM. We have developed certain scenarios where security will determine some unique operations because it is a crucial requirement for society.

First, when the video stream starts, it begins counting how many faces are in the atm room. If more than two faces are counted, some strange behavior will be assumed to be taking place. The notice will be issued to the affected individuals or banks as soon as it has been determined that sending more than two faces will prevent the same.

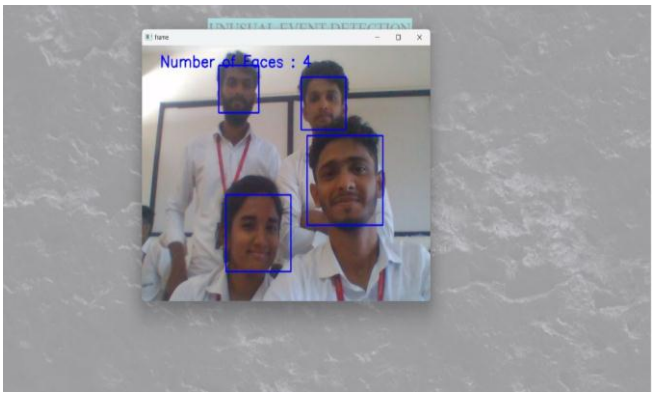

Fig-1: Identification of more than two faces

The review has addressed a variety of use cases and testcases for object detection using open-cv, python, and YOLO for sending messages to police stations, kitchen knife identification, and helmet detection, closing the ATM door automatically, and detecting multiple people using convolution neural network, Haarcascade algorithm, and Background Subtraction. Convolutional neural networks are a type of deep learning system that may assign importance to certain items in a system that may assign importance to certain items in a picture as well as differentiate between them. We may transform images into frames using cascade classifiers, resize them, and use the yolo technique to determine anticipated classes.

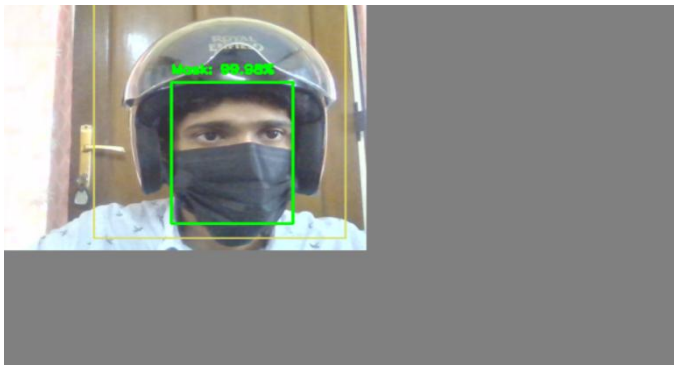

Fig -2: Detection of mask

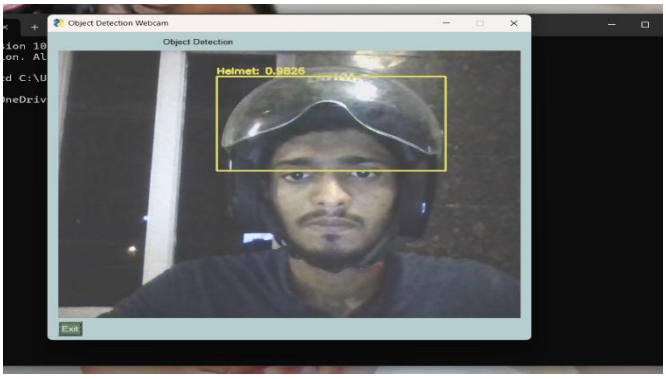

Fig-3: Detection of Helmet

The motion detection technique for face recognition also employs cascade classifiers. In the future, by utilizing this model in ATMs, we will be able to create effective machine learning models with improved security systems wherever security is crucial. These models will also have good accuracy for results. The ultimate goal of a fully automated video surveillance system is event recognition. Identifying the kind of motion that is significant in a video surveillance system is a difficult challenge. Background subtraction is used to detect the objects in event recognition before their In order to create a skeleton, boundaries are extracted. This skeleton structure offers crucial motion clues, such as posture and body language. The motion patterns of segmented blobs can be used to recognise and detect events like fights, theft, overcrowding, and more.

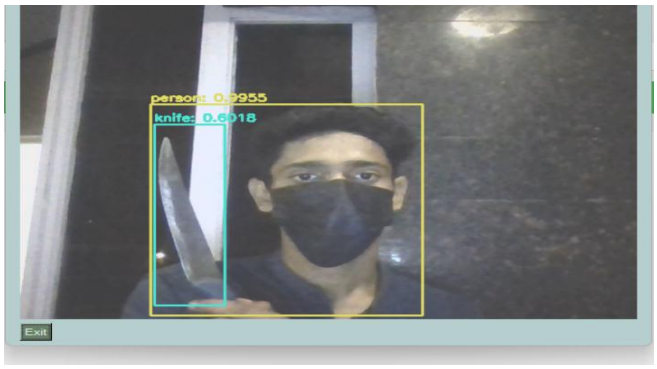

Fig-4: Detection of knife

Through the Telegram application, users may sign up to receive notifications as soon as any unusual events are recorded, such as in an ATM, so that they can get in touch with local police officials and file, a report.

Fig-5: Sending message to concerned authority

5. CONCLUSION

This research investigates the detection of abnormal occurrences in ATMs using machine learning algorithms.

The ATM type is designed to provide more reliable security by incorporating facial recognition technology. We even try to maintain the functionality of this ATM machine to a greater extent by minimizing the time delay of the verification mechanism. By identifying and authenticating owners' accounts at the ATM with biometrics, the problem of unpredictable transactions can be remedied. We attempted to advance a solution to the issue of false transactions, which is a frequent issue, by utilizing ATM biometrics. This strategy, though, would only work if the account holder was present. The unauthorized ATM transactions that happen

without the knowledge of the true owner can be stopped. Using a biometric feature for identity is robust and safe, even when other characteristics are used at the authentication level. We invite researchers to carry out additional studies on machine learning methods for identifying rare events in order to increase the model's effectiveness in light of our work. Another issue that needs to be addressed is the model's precision. As a result, we created an ATM model that uses facial recognition software to more reliably provide security. We even attempt to retain the effectiveness of this ATM system to a larger extent by minimizing the time spent in the verification procedure to a minimum. The much-needed and much awaited answer to the issue of unauthorized transactions is provided by biometrics as a method of identifying and validating account owners at the Automated Teller Machines. Through biometrics, which can only be used when the account holder is physically present, we have attempted to give a solution to the feared problem of fraudulent transactions through automated teller machines. As a result, it eliminates instances of unauthorised transactions at ATM locations.

6. REFERENCES

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