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Video Surveillance System and Violence Detection

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Abstract

The Video Surveillance System is an enhanced version of modern CCTV surveillance. The system is trained using Yolo algorithm to detect the weapons and also is trained using Convolutional Neural Network (CNN) to detect Violence in public places. The system not only detects but also it sends notification to the central control of the system like Police Stations and the police will be able to take necessary actions. The users can also send complaints and use the android application in case of emergency to alert the police if the user is in danger situations. The police will be able to take quick actions using the locations available with the complaint or emergency. By combining CCTV surveillance and weapon detection the system can act as a Central Surveillance System. The system will not record the full video instead take the snapshot of the detected weapons or violence and send it to the admin saving the memory.

Keywords: Violence, Alert, Detection, Security, Video Surveillance

1. Introduction

system safe from attackers is through video surveillance. The surveillance system has a significant impact on security. The term "surveillance" refers to the monitoring of a person's, a group's, or an area's activities. Numerous uses exist for it, including those for banks, hotels, hospitals, farms, and traffic signals. Closed circuit televisions (CCTVs) are a common security tool today. Digital or network video recorders, IP cameras, and video surveillance have grown incredibly widespread worldwide. Taking into consideration the value of CCTV in criminal

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investigations, it was found that 45% of crimes are captured on video and 70% of investigators made use of CCTV. But the security offered by these CCTVs are insufficient. CCTV systems in use today are only able to record things; they cannot respond to changing circumstances. Almost everybody uses CCTVs, yet for some reason, they don't offer the necessary level of security. Infrared, image processing, object recognition, and other technologies all contribute to enhance the security provided by the CCTV systems. Nowadays, CCTVs are deployed practically everywhere. They are only used to record live video of events taking place inside its walls. Most frequently, someone will be stationed to keep an eye on the video streaming. Additionally, in some other circumstances, CCTV video will be recorded and seen only if an incident had occurred. Higher authorities have a strong possibility of identifying the culprits from the camera footage if a crime occurs in a public location. Due to their ability to record both still images and moving pictures, security cameras serve as the main source of evidence in courts. Images and video that are saved make the case simpler and solve quickly. The monitoring of evolving information or behavioral behaviors is referred to as surveillance. It gives one a feeling of security. The System is an advanced way of developing video surveillance software. The algorithm will be able to spot odd behaviour as well. The perception of aggression and the identification of objects may be among these peculiar alterations. The technology notifies the Police Station of any suspicious activity as soon as it detects it by sending a notification to security. Comparatively speaking, it uses a lot less storage space than a standard monitoring system. The nearest police stations' information must be entered into the system. An indication of the action was included in the notification to the police station. this research work can function as a police surveillance system by combining theft detection and video surveillance.

2. Background Study Convolutional Neural Network

Convolutional neural networks are a type of artificial neural network used most frequently in deep learning to analyse visual data. The shared-wright architecture of the convolution kernels or filters that slide along input features and create translation- equivariant outputs known as feature maps, CNNs are also called as Shift Invariant or Space Invariant Artificial Neural Networks. Contrary to popular belief, most convolutional neural networks only exhibit equivariance rather than invariance to translation. They have uses in the recognition of images and videos, recommender systems, classification and segmentation of images, analysis of images used in medicine, natural language processing, brain-computer

interfaces, and time series analysis of financial data. Multilayer perceptron derivatives, or CNNs, are regularized variants. Fully linked networks, or multilayer perceptron, refer to networks where all of the neurons in one layer are connected to all of the neurons in the following layer.

3. Related Works

When the camera notices an incursion, it triggers the alarm system, records the intruder's image and transmits it to the owner through email, SMS, and a phone call at the stored numbers. Once the siren system is turned on, only the user is able to deactivate it using the random password that is supplied through email or SMS. Any CCTV gear can be connected to the system by using the IP address of the corresponding camera. The system is able to distinguish between the different things. Because a random password is sent to the user's phone and email everytime they log in to the login panel, the owner doesn't need to remember it in order to turn on the camera that is used n gathering the information about uneven motion to detect violence. The technique calculates the object's velocity vector from the image. Eight directions were quantized into the estimated motion vector. The analysis of the co-occurrence in the direction of the quantized motion vector identifies the violent event. The object region of a video image is found using a background subtraction technique. If the difference 7 value is more than the previously defined threshold value, the background image is modified after creating the adaptive background image to detect object region. The movement of the thing is erratic.

In the area where an object has been spotted, the system estimates the motion vector using a mixed local and global approach. The system examines the properties of motion vectors generated in the object region using the Motion Co-occurrence Feature (MCF). In order to employ the motion vector features that show up in the violent event, the suggested method calculates the optical flow of the object region. The estimated optical flow is utilised to extract the MCF feature, and the irregular motion data in the MCF is used to detect the violent event. The results of the experiments demonstrate how well the suggested strategy can identify violent incidents. Applications for this technique include customer behaviour analysis and intelligent surveillance systems. To examine the features of the motion vectors produced in the object region, the system makes use of the Motion Co-occurrence Feature (MCF). The motion vector's co-occurrence distributions are represented by MCF. The object region of a video image is found using a background subtraction technique. If the difference between the input image and

the background image is greater than the previously determined threshold value, the background image is updated after creating the adaptive background image to detect object region. The movement of the object is erratic during the violent incident. the motion vector estimation is done using the combined local global method with total variation (CLG-TV) in the identified object region in order to make use of this property.

This article discusses the design and construction of a smart surveillance monitoring system for mobile devices utilising a Raspberry Pi and a PIR sensor. It improves how well mobile technology is used. Information is gathered by the suggested home security system, which then uses the Internet to deliver it to the proper mail. Raspberry Pi functions manages cameras and motion detectors so that it may be seen and heard from a distance. With the use of an infrared sensor, it can also determine how many people have accessed it. The security provided by the Raspberry Pi on both sides makes it advantageous. It only allows the person concerned to read the details because it is authenticated and encrypted on the receiving side.

To gather the information about uneven motion to detect violence. The technique calculates the object's velocity vector from the image. Eight directions were quantized into the estimated motion vector. By examining the co-occurrence in the direction of the quantized motion vector, the violent event is discovered. The object region of a video image is found using a background subtraction technique. If the difference 7 value is more than the previously defined threshold value, the background image is modified after creating the adaptive background image to detect object region. The movement of the thing is erratic. In the vicinity of the identified object, the system calculates the velocity vector using a mixed local and global approach.

4. Existing System

The current video surveillance system uses cameras to keep an eye on the document activity in a variety of settings, including residences, businesses, public spaces, and other institutions. A network of cameras, storage units, and monitoring software are often part of the system, which enables authorized people to access and examine the recorded material. At present, the visuals need to be monitored by a person and it cannot detect the weapons or violence automatically.

5. System Requirements

Software Requirements

- HTML
- JavaScript
- Bootstrap
- Flask
- MySql

Hardware Requirements

- Processor: Intel Pentium Core i3 and above, 64 bits
- RAM: Minimum 4GB RAM
- Hard Disk: 10GB
- Video Surveillance System like CCTV

6. Proposed Methodology

As Security is the major concern for a city. Smart security systems are currently in great demand because of the growing population and urbanization. This method of developing video surveillance software is innovative concept for the organizations that frequently uses video cameras and continually record as well as store the captured video footage for days or months. To store these enormous video footages, a lot of battery storage is required. This improved version of organization security uses video surveillance to continuously monitor changes within the organization but only records those that are unusual. One of these strange changes could be the detection of theft or attack.. Using a dataset of violent image examples, teach the algorithm to recognise violence. The system takes action and notifies the user by sending a notification to the security about any strange activity as soon as it detects any unusual activity or any anomaly. The system's key benefit is that it immediately notifies the user of any questionable behaviour nearby and uses face recognition technology to identify criminal faces. Compared to a standard surveillance system, it needs significantly less or no storage space. The project can serve as a police surveillance system by combining theft

detection and video surveillance. The system also contains a feature for recognising and detecting faces. It makes it simpler to find trespassers, criminals, burglars, and thieves. Businesses will be able to manage who has access to their premises and the technology will be able to verify identities without halting anyone. It assists in automating the individual recognition with high accuracy within a few seconds. The main advantage of facial recognition is how well it integrates and works with current security software.

The model consists of 4 parts:

It is Admin, Police Stations, User and Video Surveillance

Admin

An admin has the power to control all important activities in the system. They can login into the system and can manage places. The admin has the control to manage Police Stations like Adding, Removing and Updating the Police Stations. Admin can also view and track the status of Violence Detection.

Police Stations

The Police Station module can login with their registered login details. Police Stations receive the notification about the Violence happened. They can view Violence Detection and can view the evidence of the violence. The Police will be able to see the request send by the user. The police also can login and see the emergency request and complaint sent by the user using the location.

User

The user module can register in the android application with the details of themselves. They can login into the application with the login details. They can view the status of the activity. The user can register a complaint if the user themselves found any issues. The complaint will be sent to police station with their location details. The user can also send an emergency if the user is in an emergency condition, The emergency will be sent to police station with the location details.

Video Surveillance

It is the most important module of the system. This module does the important feature of the system, Violence Detection and Object or Equipment's Detection. The system uses

Convolutional Neural Network (CNN) for Violence Detection in public places. The system uses Yolo Method to detect Objects carried by the people to detect whether is there any harmful objects. This module also sends a notification to nearest registered Police Stations about the violence detected. The Police Station can view the evidence and can take the necessary actions accordingly.

System Architecture

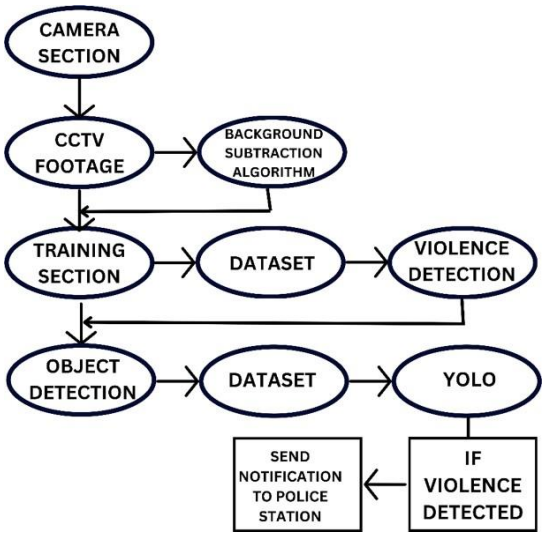

Figure 1. System Architecture

7. Algorithm

The algorithm used for object detection is YOLO. The Yolo is one of the best algorithm for object detection. In Yolo use class called Weapons for the object detection. The algorithm used for Violence Detection is Convolutional Neural Network (CNN).

In the object detection, it is done through live video surveillance, the video is taken live using OpenCV method and the taken video is matched with the algorithm for class weapons in the Yolo Algorithm. If the video contains weapons, the algorithm is set to have a square marking of the weapon along with showing weapon and taking the snapshot of the weapon and uploading it to the Admin.

In the violence detection, the video is taken through OpenCV and checked with the algorithm, if any movement similar to the trained image occurs, it will detect the violence and mark the border of the video as red.

For the creation of web application, software's like HTML, JavaScript, Bootstrap is used and framework is flask and database used is MySql.

The Mobile Application is created using Android Studio and Java.

8. Dataset

The dataset or algorithm used for object detection is Yolo. The dataset is taken from Yolo. It is directly accessed from the Yolo. The class used is Weapons in Yolo.

The algorithm used for Violence Detection is Convolutional Neural Network (CNN). The system is trained using 50 images related to violence. The performance of the system can be improved by training with more datasets.

9. Result

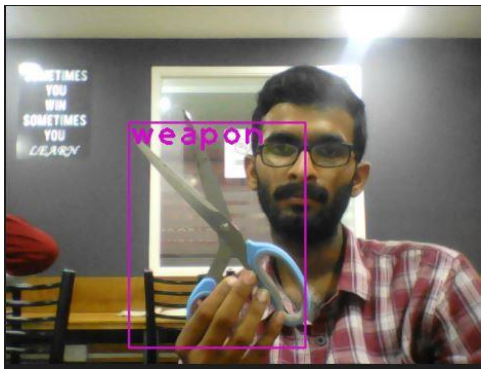

Figure 2. Weapon Detection

Figure 3. Violence Detection

Figure 4. Admin Login Page

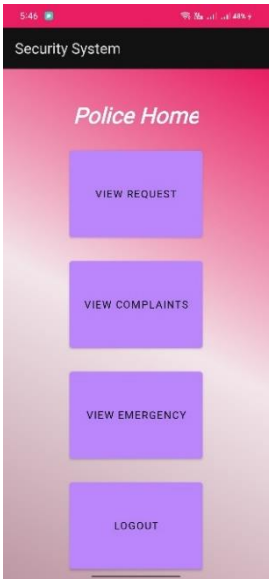

Figure 5. Police Home Page

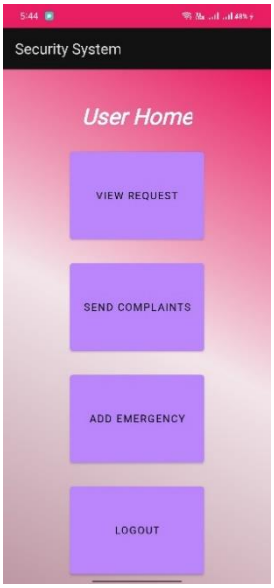

Figure 6. User Home

10. Conclusion

Every smart city should have this surveillance, and it may be implemented by raising public awareness of the value of local security. As a result, the surveillance camera's architecture allows for efficient and secure image and video capture. The suggested solution uses significantly less memory because it only records video and takes pictures when motion is detected. You can use the System to discover any odd activities. And in the locations where there is a possibility of strange occurrences. Nearly anywhere, including temporary job sites, can have remote video monitoring cameras installed. By eliminating the need for extra full-time employees or their contractor counterparts to watch the property, these solutions assist as well as saves cost. The many benefits of video monitoring make it a sensible choice for most firms. Installing monitored security cameras at a business ensures that there is always a level of security present and provides reliable 24/7 surveillance. Additionally, if there are any suspicious activity or break-ins, a skilled security expert will watch the channel and act remotely. Using the onsite loudspeakers and alarms, they can deter crimes in progress and instantly inform the police and the corporate workers.

The advantage of this system over existing systems is that, the existing system cannot detect the weapons or violence. This system can detect weapons and violence in the public system. The system also helps public users to use the android application in case of their emergency situation to report the issue with the police with the user’s current location.

11. Future Scope

The applications for video surveillance are constantly evolving and surprising. Video surveillance has advantages and is used in a variety of contexts, including traffic monitoring, business operations, and even sporting events. Systems for monitoring video are extensively used now and will eventually become more complex ones. The main applications are for traffic monitoring, advertising, and workplace safety. In addition to safety, monitoring has other purposes. These techniques can be used by retailers to create ideal store layouts and even to avoid bottlenecks. To avoid accidents, and keep people safe from crimes monitoring is vital to the society. The impact of video monitoring in the future on society will be significant. It aids in reducing societal problems. The security can be expanded to a greater region by deploying high-efficiency camera systems. The system can also be trained to detect accidents and fire accidents by training the system using the required datasets.

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