Providing Real Time Safety and Security by Detecting Humans through CCTV

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Abstract

This paper reports the development of smart Closed Circuit Television surveillance camera that would start recording only during human intervention and automatically stop recording when there is no human in the frame.The YOLO (You Only Look Once) algorithm was adopted to detect the presence of humans in the live video frame of CCTV and OpenCV algorithm was used for capturing the images and videos. The authenticated person could control the overall process by starting and stopping the surveillance and providing the time frame when they need the surveillance to happen. In this manner the system would provide real time safeguarding against any crime or unethical activity, along with reduced storage for faster access when needed.

Keywords: *Computer Vision, YOLO Algorithm, human detection*

1.0 Introduction

Computer vision is referred as the field of computer science which focuses on replicating parts of the complex human vision system and allows computers to identify and process objects in images and videos in the same manner as humans do. The existing system, specifically in CCTV, consumes lot of storage in terms of memory required to record each and every activity. Although CCTV cameras have gradually increased in numbers, yet crimes, frauds continue to take place. It is always a challenging job to monitor the CCTV visuals continuously;hence it is necessary to integrate CCTV with Computer Vision (CV) techniques. The proposed system helps in integrating CCTV with Computer Vision techniques using OpenCV and solve the problems prevailing in the existing system.

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Some of the researchers have worked in this direction. R Mehta, et al. [1] reported an outlawed intrusion that can end up being detected and informed and at the same time of movement detection, it continuously scans a specific location for any occurrence of motion.C Savitha et al.[2] explained several techniques to discover the movement in the moving object and also to monitor individuals, events and actions. U S Saleem et al. [3] proposed a method to discover strange detection of events perhaps in the reduced image resolution videos using Adjustable-Rate Mortgage 7 LPC 2148. B Narvekar et. al. [4] discussed the process associated with detecting human movement accurately inside a video and then informing the authorities similarly. T Juhana et. al.[5] discussed about implementation regarding monitoring systems, directed for home CCTV surveillance. J S Kulchandani et. al. [6] investigated the actual condition of moving targets from a given sequence of online video frames. A Upasana et al.[7] developed a motion for recognition system that may be helpful regarding detection and reallocation of the object without the particular existence of darkness. YI Yoon et al.[8] reported an improvement associated with a wise statement framework for city security inside an educational domain. S Parveen et al. [9] reported about action detection computer program that permits to find the activity around an area of interest or a vision area. S Saha et. al. [10] reported the centralized computer structured application that determines movement of human beings in the target area and keep the image evidence of the movement by making use of a camera. J Valente et al.[11] reported a common algorithm to infer actions noted by the digital camera, even though the visitors are encrypted, in addition to security vulnerabilities that will allow a web-affiliated attacker to acquire access to this frame.

The presently available system requires intensive manpower, high memory and time-consuming techniques to save the activities. The objective of the present work is to develop a smart surveillance system that could stop a crime and record the event onlyif human presence is detected under the CCTV. The authority need not have to check in the complete recording to find the exact video as the video recording would be available for a particular duration at which unethical or criminal activities occur. The activity would be saved with the current date and time. The proposed system can be adopted at several places such as shops, schools, banks, colleges and places where certain valuable things are kept or the places where human presence is prohibited for a certain time interval. The overview of the system is as shown in Fig. 1.

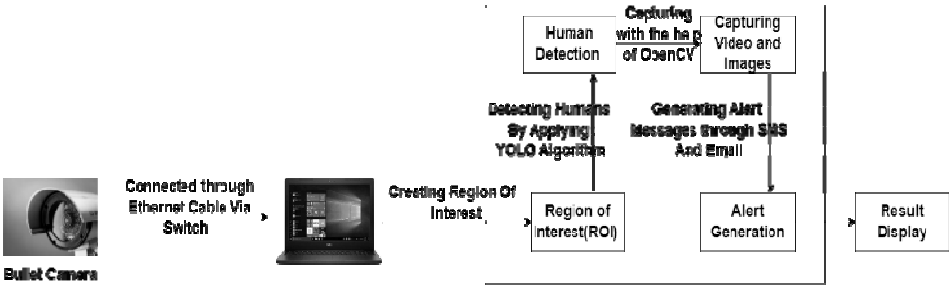

Fig. 1. System Overview

2.0 Proposed Smart Surveillance System

There are mainly four main stages in the proposed system namely, obtain live video frames, human detection, capturing images and recording videos and performing action.

2.1 Obtaining Live Video Frames

The live streaming of the real time video feed data from the camera is collected with the help of Real Time Streaming Protocol (RTSP) Link. Bullet Camera (which has anIP address) was adopted by assigning the same class IP address to both camera and laptop. After establishing the connection, verification of the connection is done through the ping command. The live video frames are receivedvia the network connected through a switch. The method available in OpenCV is cv2.VideoCapture ( ) command is adopted to take the RTSP link as an input to fetch the live video feed as shown in Fig. 2.

Fig. 2. Receiving live video feed by connecting CCTV camera with laptop

2.2 Detecting Humans

On the video feed received, the authority starts the detection algorithm and sets the time duration for the surveillance. If any object comes under the region of interest created through CCTV then YOLO Algorithm is applied on the video feed received which starts checking if the entered object is human or not. If humans are detected then it assigns a bounding box around the human and labels it as a person.

2.3 Capturing Images and Recording Videos

The presence of objects is detected by the YOLO algorithm. Once it is confirmed that the object present under CCTV is human then with the help of the methods available in OpenCV the images are captured and recording starts. The recording continues till the moment a human is present under the CCTV and is doing any kind of activity. Once the human leaves the frame, recording stops and the video file is saved in the local storage. The recording of videos and capturing the images happens in the time frame set by the authority or owner or admin for the surveillance. OpenCV has different methods such as cv2.imwrite() to save images and cv2.VideoWriter () to record the video and write or save into local storage.

2.4 Performing Action

Alert is generated if any human is detected under CCTV surveillance. SMS is sent to the registered mobile number of the authority or owner. Email is sent on the email address registered by attaching the image captured from the region where human intrusion happened.

3.0 Results and Discussion

The web application is developed to make it easier for the authorities to start and stop the surveillance. The authorities can provide their time frame like start and end time with the help of a drop down menu. They can do the surveillance according to their convenience. When the human enters the frame, recording starts and the image is captured (Fig. 3 and 4). The alert is sent using SMS and Email as shown in Fig. 5 and 6. When a human leaves the frame the recording stops (Fig. 7and 8). The recording is saved in the local storage with the current date and time as shown in Fig. 9 and 10.

Fig. 3. Input as human entering the frame

Fig. 4. Recording Started and Image Captured

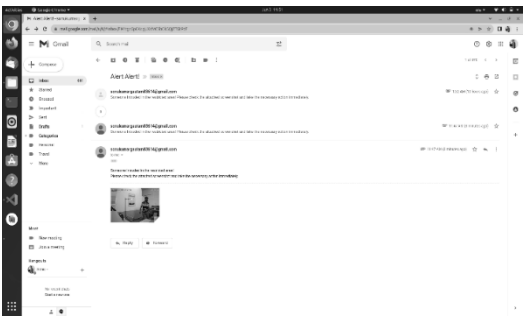

Fig. 5. Mail Sent to the authority

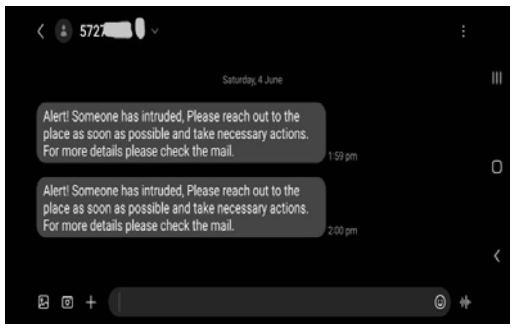

Fig. 6. SMS Sent to the authority

Fig. 7. Input as Human leaving the frame

Fig. 8. Output as Recording Stopped

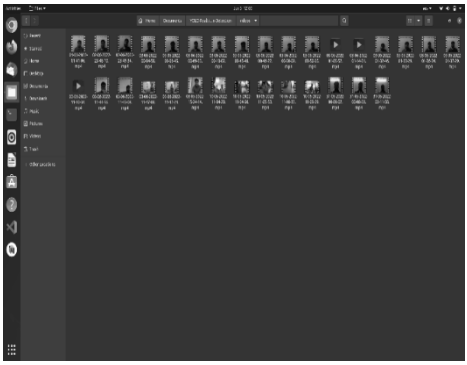

Fig. 9. Recorded video saved in local storage

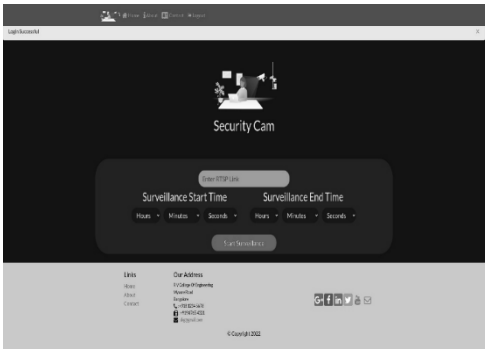

Fig. 10. Web Application for Authorized Users

6.0 Conclusion

This paper aims at reporting a smart surveillance system with the use of computer vision techniques to effectively control the criminal activities. The model can be deployed so that it detects humans in real time and provides alerts through SMS and Emails. The system also incorporates a feature for setting a particular time range in which the surveillance is required which in turn helps in saving memory resources and providing only the recording of the necessary video feed. The system sends the image of the intruder attached with the mail and also keeps on recording all the activities till the time intruder was present.

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