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Autonomous Surveillance Cam-Recorder System

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ABSTRACT: An autonomous camera based object tracking and behaviour monitoring system for recognizing complex activities in real time mode. Video surveillance is becoming increasingly important for security-sensitive areas and thus the proposed system is an Autonomous Surveillance Cam-recorder System (ASCRS) to detect human and track their activities. ASCRS is composed of human detection in real time surveillance using image processing (IP) and behaviour analysis using artificial intelligence (AI).

KEYWORDS: Intelligent videosurveillance (IVS), Image processing (IP), Artificial intelligence(AI)

I. INTRODUCTION

We live in a 24/7 working environment where nobody knows whether a particular place is safe from burglars, criminals, terrorists etc. and no human intervention spot can be 100 percent safe. In order to improve the security, there arises a need to have an autonomous surveillance system. Many systems have been introduced but there exists many bugs and errors such as false positive alarm, error while transmitting video sequences and it also requires continuous human monitoring which may cause overlooking some suspicious activities. So a need for an Intelligent Video Surveillance(IVS) was proposed i.e. ASCRS which accomplishes image capturing and image processing for human detection using IP and its behavioural analysis for any suspicious activity through the algorithms based on AI. Here the system in action is a learning agent which captures and stores any real time suspicious activity and based on these activities classifies the current state to be suspicious or not. It also has an advanced alert and prevention system which activates the burglar alarm and sends alert to various authorized people related to the firm of this surveillance system. First the IP based algorithms work upon these video footages which gives output to the AI based algorithms upon which the duty of analysis of suspicious activity and alerting relies. The flow of the system is a sequence so as to maintain a proper and efficient working of the ASCRS system.

II. EXISTING SYSTEMS

In the current existing systems, a burglar alarm system is implemented using two different methods. I) Motion detection- Here motion of any object is detected and identified according to object motion algorithms. Since the speed of a human is not that fast the frames are compared at an interval of 2 seconds.ii) Object detection- Here object such as human is detected by creating blobs around the detected object in motion and its height to width is compared for detection of object as a human being. If it lies in the range of 1.6-1.8 then the detected motion is a human motion. These systems exhibit some limitations such as- I. Ghosting effect occurs while comparing the frames. ii. Blob created across this object might contain two objects thereby decreasing the efficiency and increasing the complexity of the system. iii. The detected object might have a ratio between 1.6-1.8 but may not be of motion due to human thereby generating a false alarm. iv. Also over processing of the image frames can be a big issue. v. Noise may also create a false positive alarm.

III. LITERATURE SURVEY

In the paper [1],the author proposes a system called algorithm based object recognition and tracking(ABORAT) which is used to detect objects that are very close to each other and their trajectories are extracted which are used for autonomous classification. In algorithmic design segmentation of moving objects from background is done. Next object tracking is done and then trajectory classification takes place where an abnormal activity is divided into parametric and non-parametric properties. The final stage is to generate alerts which include object type, zone, tripwire

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violation and behavioural alert. In the paper [2], the author proposes a system which makes it possible for the computer to automatically locate, recognize and track the monitoring changes by the automatic analysis of image sequences which is captured by camera in normal conditions. The flow of the system includes video capturing which is used for detection and tracking of target model. In the next stage using image analysis behavioural understanding the behaviour of target object is saved and an alert is generated in case of any suspicious activity. In the paper [3], the author proposes a visual behaviour analysis tool for consumer video surveillance which is developed using a special kind of gamma Markov chain for background modelling and Petri Nets for object classification. The proposed system considers abnormal events which occur in common consumer environment. The video input is processed by applying background subtraction method to extract objects over time, thus it assumes that the state probability of each pixel depends on state of neighbouring pixel. In the paper [4], for the more efficient use of video data the author proposes a system in which pre-analyzing state is combined with the sensor so that the important part of the video is identified and the other waste part is deleted. To make it efficient to transfer the data, it is compressed in H.264/AVC format. Finally to reduce the space and get only the region of interest different types of filtering viz. spatial and temporal filtering techniques are used. In the paper [5], the author proposes a system that can hide the information of the communication parties involved over the internet. In this system the image is divided into several parts. First the secret message is converted to cipher text using AES algorithm and then the cipher text is embedded to a part of secret image. Then steganography is performed on image. The parts obtained are stitched together using k nearest method.

IV. PROPOSED SYSTEM

The system is an automated burglar system which can automatically locate, distinguish and track the changes by automated analysis of image sequences captured by camera in real time conditions.

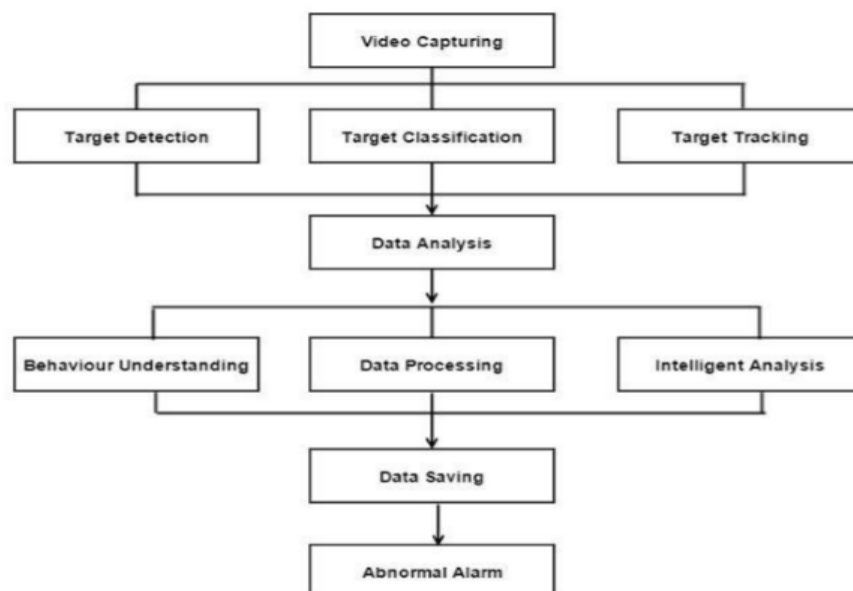


Figure 1 The Structure of Intelligent Surveillance System

In the Figure 1 the basic structure of intelligent video surveillance system is shown where video analysis involves target detection in a dynamic environment and use the tracking algorithm to track the target and behaviour of the target is studied [2].

A. Image Processing

Image Processing deals with capturing various images at fixed intervals of time from the current footage of video recording to process it for the desired application. These captured images are processed to find the variation between

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consecutive frames for finding any motion detection due to any object and for tracking its moves by collecting these frames where the differences is found and sending it to the AI part for further analyzation of any human detection.

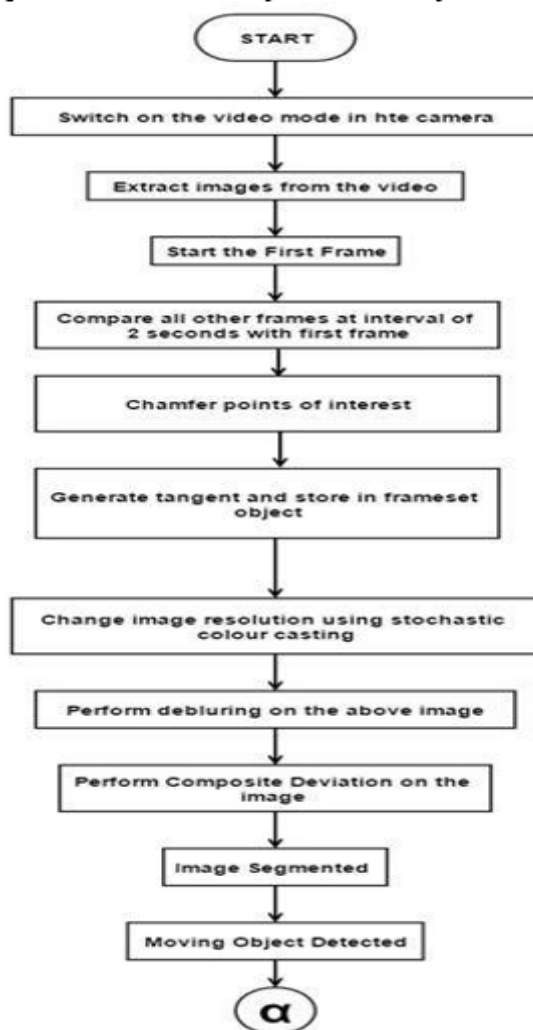


Figure 2 Flowchart for Image Processing

In the Figure 2 the flowchart for the video analysis part of the system is shown where initially the system is switched on to the video mode by which the autonomous system can extract the images from the video. It then compares the frames at two second interval and then pass the output for the further analysis and processing to various algorithms. Firstly it chamfer's the point of interest on the real time video as well as the training dataset and generates tangents and stores in frame- set object for detecting moving object and then processes it with stochastic colour casting algorithm and with respect to this it carries out the processing of deblurring over the images frames to get the correct brightness of the image using the composite deviation algorithm. Thus by following the above procedure the system autonomously does the image segmentation and thus the moving object/human is detected from the frames.

1) StochasticCasting algorithm converts colours into any other colour intensity (predefined monochrome colours). Studying and analyzing an image in Grey scale or any other mono chrome shade i.e. intensity is better than analyzing an image with multiple luminous intensity. It is a rapidly advancing field in terms of signal processing where data manipulation can be done easily and with minimal computational complexity ,the specific techniques that this algorithm includes is image restoration, image segmentation and feature extraction. It is widely used in medical industry where it plays a vital role as tools for disease and illness identification for health practitioners. For image

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restoration this algorithm accepts a corrupt image and estimates the original image with the help of mathematical calculations that focuses on Markov Random field and its applications. In computer terms image segmentation is the process of partitioning the digital image into various segments for the purpose of data manipulation in feature extraction which is widely recognized for computer learning, pattern matching and image learning purposes where it starts from an initial set of measured data and build/modifies it to a derived value intended for non-redundant i.e. extraction of informative or the data which is of interest depending on the application.

2) Deblurring Reposition algorithm deblurs the focus on the detected object in motion and separates it from the background. Here the problem arises when an image is blurred by any unknown moving object which consists of layers blurred with different degrees which need separate processing for its deblurring. Trying to deblur the whole image involves deconvolving entire image with the same kernel causing some serious problems so the image is divided into segments depending with a particular segment involving only one region of different blur therefore after deblurring the whole image which involves processing where the blur region is passed to a function where its distributive derivative with one filter is found so that the regions true natural size can be known and adjusted accordingly. Afterwards where image restoration is done using the calculated divisional segments management where each segment is given a particular no that identifies its position and its significance in the original image.

3) Composite Deviation algorithm: Compositing is a commonly used operation in image analysis. A realistic composite comprises adjusting the foreground and background appearance to make them appear compatible. Using statistical and visual perception, it is used purely for segmentation of the image, wavelength analysis and description, luminosity for full light and composite for low light. With the sequence of these image processing algorithms, a number of 2D image statistical measures are identified and the observations are analyzed.

B. Artificial Intelligence

AI part of the system processes over the input from IP part for classification of the detected motion and monitors it for any suspicious activity through the trained data set and correspondingly generates a ring as an alert notification and also sends an alert to the supervisor.

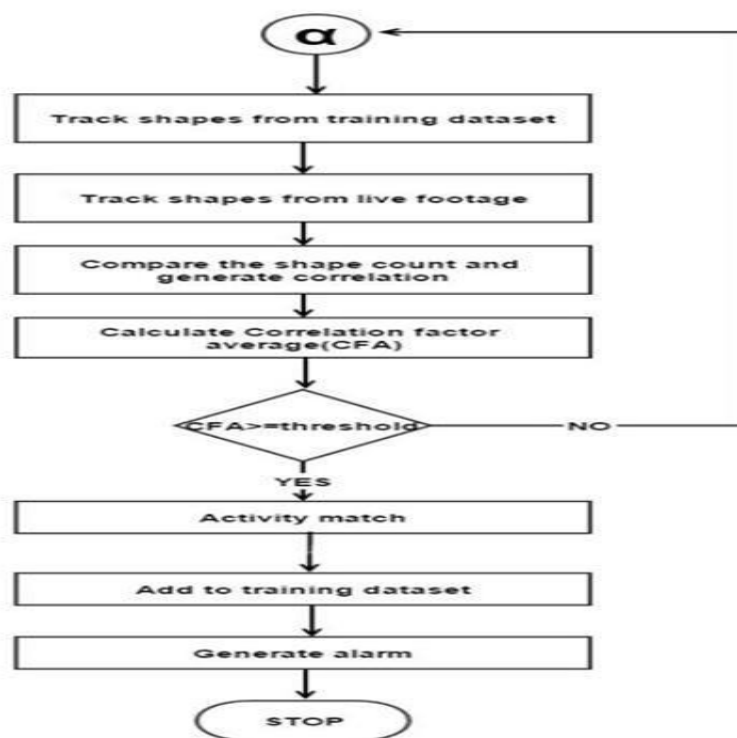


Figure 3 Flowchart for Artificial Intelligence

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In the Figure 3 the flowchart for the behaviour analysis part of the system is shown where initially the system does the study and comparison of the behaviour of target. Here we track the behaviour of the moving target and then compare it with the behaviour of the agents knowledge about different suspicious activity from training dataset. The system tracks the shapes of the live footage as well as the training dataset frame by frame up to the cut-off length and generates a correlation factor for each frame. After calculating the correlation factor average(CFA), it is compared to the threshold which is predefined. If the CFA is greater than or equal to threshold, it implies the activity in training dataset and live footage are similar i.e. the activity is suspicious. On detecting a suspicious activity the alarm is raised and a notification is passed to the authority/authenticated person about the suspicious activity. This processing of combining IP phase and AI phase makes the Autonomous Surveillance System in the best working condition and thus fulfilling all the security measures an organization needs. (1) Naive Bayes algorithm is used to check the neighbouring pixels at a time interval and classifies it accordingly under different classes of shapes and also determines the shape of the detected target and find the relation between the shapes and save it in a file and pass it to hill climbing algorithm for further analysis. (2) Hill Climbing algorithm used here is a modified version of the standard where multiple frames are compared and also used for induction, recursion for pattern matching and decision making for multiple pattern. Thus the ASCRS system is a combination of IP where the motion is detected and thereupon the AI part classifies the detected motion to be a suspicious activity from human intervention which results in the activation of an alert system for warning against the detected suspicious activity thereby classifying it as an intelligent video surveillance system which is an advanced, secure and highly dependable as compared to the existing surveillance system.

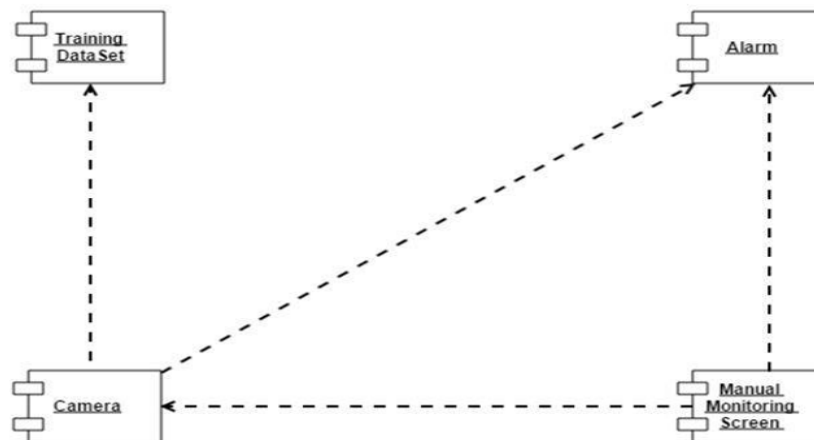


Figure 4 Component Diagram

In the Figure 4, the camera gives input to the system and comparing the data captured from the camera and the training dataset the system decides whether to ring alarm or not. The footage is monitored live by the system continuously. The system will detect any suspicious activity based on the training data set which will be stored in the database previously. It is also monitored by the manual monitoring system which has the control over the system and its functions.

V. SIMULATION RESULTS

The simulation result shows the behavioural classification of an object in real time surveillance as shown in figure 1. The proposed algorithms are implemented with the help of opencv and java using NetBeans as the platform. We developed the training dataset by recording various suspicious activities which can occur in a particular environment and compared the real time activities with the training dataset footages. The above proposed algorithms were implemented on both the real time footages as well as on the training dataset footages to generate the appropriate correlation factor average(CFA). In a real time surveillance if any suspicious activity is detected then the system generates an alarm and notifies the supervisor so that he can take appropriate action for the detected suspicious activity.

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In case where no suspicious activity is detected then the system does not generate an alarm and continues with its normal monitoring thus not generating any false alarms.

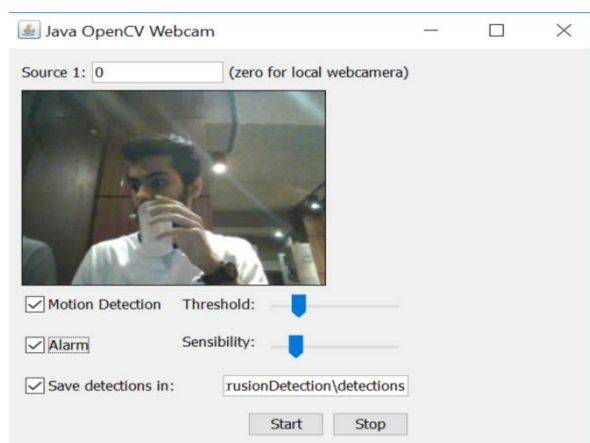


Figure 5 Non-suspicious activity

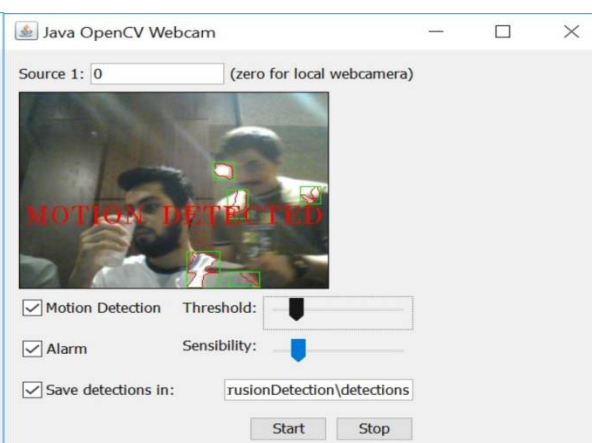


Figure 6 Detected Suspicious Activity

In the figure 5, the system monitors in real time environment and there is no suspicious activity and thus the system does not generate any alarm. On the other hand, in the figure 6, the system while monitoring detects a particular activity to be suspicious with the help of proposed algorithms and thus chamfers the moving object which are highlighted and generates an alarm to the concerned supervisor.

VI.CONCLUSION

Autonomous surveillance Systems have become significantly important these days due to aneloquent increase in the number of criminal activities. Intelligent Video Surveillance helps to overcome the necessity of continuous human monitoring behind the system in traditional surveillance systems Introducing the algorithms of Image processing and artificial intelligence in real time surveillance,such systems transform video surveillance from a data acquisition tool to information and intelligence acquisition subsystems.Real- time video analysis provides smart surveillance systems with the ability to react to an activity in real-mode thus acquiring relevant information at much higher resolution. The long-term operation of such systems provides the ability to analyse information in an automated environment as such systems evolve since they are learning agents which store and understand the various types of suspicious activities using a training dataset during their initial learning phase and later using their knowledge for monitoring in real-time, thus providing a very rich mechanism for maintaining situational awareness. With the use of IP and AI based algorithms used for filtering objects as humans and detection of any suspicious activity leading to a secure and accurate alarm triggering system as compared to the current surveillance system leading to a safe social security.

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REFERENCES

- [1] Kofi Appiah, Andrew Hunter Jonathan Owens, Philip Aiken and Ki- trine Lewis -Autonomous Real-time Surveillance System with Dis- tributed IP Cameras, Third ACM/IEEE International Conference on Distributed Smart Cameras (ICDSC 2009).
- [2] Lin Lashing, Liu Zhiguo,Zhang Yubin-Research on Detection and Tracking of Moving Target in Intelligent Video Surveil- lance,ICCSEE.2012.331
- [3] Thi Thi Zin, Pyke Tin and Takashi Toriu-Visual Behaviour Analysis Tool for Consumer Video Surveillance,(IEEE 2012),ISSN: 1569616445
- [4] Chokri Ben Amar, Mohamed Koubaa, Henri Nicolas, Amal Ben Hamida-Video pre-analyzing and coding in the context of video surveillance applications.



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[5] Jyotika Kapur-Security using image processing,(IJMIT) Vol.5, No.2.

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