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Smart Video Security Surveillance with Mobile Remote Control

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Abstract--- This project has a special feature of smart video transfer and capture feature. Smart video surveillance systems are capable of enhancing situational awareness across multiple scales of space and time. This project describes mobile based remote control and surveillance architecture. It is very suitable for remote bank monitoring etc. The idea is to set up a computer terminal equipped with a GSM Modem at banks, which can be used to transmit/receive video/photos and/or commands to and from the administrator/owner. This project makes use of Opencv library to capture camera images and detect intrusion using image comparison technique (Euclidean Distance Method). Once the comparison is done and an intrusion is found, it sends the streamed video from server to remote administrator over android phone. Admin can then take appropriate action and alert local security.

Keywords:Android,Real Time Monitoring,Alerts,RGB,Remote Control,OpenCV,Euclidean Distance.

I. INTRODUCTION

Observing or analyzing a particular site for safety and business purposes is known as video surveillance. Security and crime control concerns are the motivating factors for the deployment of video surveillance cameras. Video surveillance cameras are used in shopping centres, public places, banking institutions, companies and ATM machines.

Nowadays, researches experience continuous growth in network surveillance. The reason being is the instability incidents that are happening all around the world. Therefore, there is a need of a smart surveillance system for intelligent monitoring that captures data in real time, transmits, processes and understands the information related to those monitored. The video data can be used as a forensic tool for after-crime inspection. Hence, these systems ensure high level of security at public places which is usually an extremely complex challenge. As video cameras are available at good price in the market, hence video surveillance systems have become more popular. Video surveillance systems have wide range of applications like traffic monitoring [1] and human activity understanding [2].

A.Benefits of Video Surveillance

i. Availability- There was a time when the surveillance techniques were utilized only in shopping centres and malls. Now-a-days, you can notice closed-circuit televisions almost at any place you visit, from a small store to homes and holy places. As a result, they guarantee greater public security at a fraction of the cost.

ii. Real-time monitoring- Traditionally big organizations have always had the benefits of video surveillance manned by security professionals. In the past times, the events captured on video were used to expose important information and work as proof after the event happened. But, modern technologies let users to check and reply to alarms immediately.

Using a number of video cameras, a large amount of visual data is captured that is to be monitored and screened for intrusion detection. Presently, the surveillance systems used requires constant human vigilance. However, the humans have limited abilities to perform in real-time which reduce the actual usability of such surveillance systems. Also such surveillance systems are not
reliable for real time threat detection. From the perspective of forensic investigation, a large amount of video data obtained from surveillance video tapes need to be analyzed and this task is very tedious and error prone for a human investigator.

To overcome this drawback, automatic video analysis system is developed that continuously monitors a given situation and reacts in real-time. The proposed system has an ability to sense intrusion and respond to it in real time.

II. ARCHITECTURE

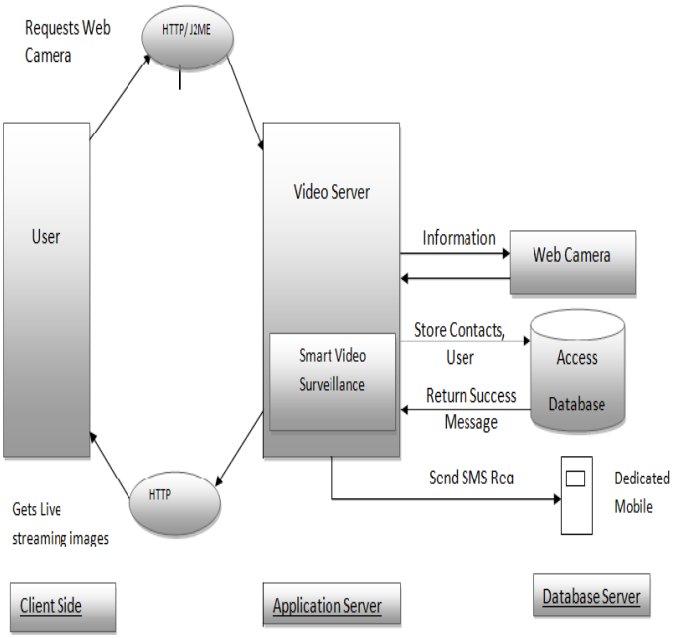


Fig 1. General architecture of surveillance system

The video surveillance system uses 3-tier architecture that comprises of client side, application server and a database server. The application server consists of the video server i.e. a central PC which is equipped with a GSM modem / mobile phone. A standard image is stored at the server. A web-camera is connected to the video server which continuously captures the images. System can start and stop camera using OpenCV functions also video recording takes place using OpenCV. These captured images are continuously compared with the standard image and it is checked for the intrusion. System contain 2 modes which DAY MODE and NIGHT MODE in which in day mode only video recording takes place and in night mode image capturing and comparing with template image takes place after detecting intrusion video recording takes place.If the intrusion is detected, the server sends notification to the authorized users via GSM modem/ mobile phone. A database is maintained that contains the mobile numbers of the authorized users that needs to be contacted in case of intrusion. The database can be made to store these mobile numbers on the basis of priority. The system also keeps the track of all the activities. Hence detailed record of messages sent and received is maintained. As soon as the intrusion is detected, the user is notified about it and the system starts recording the video. The user can login to the application and can view the recent videos. The entire surveillance system is made remote using this architecture. The user can control the system from a remote place. System receives commands from administrators which are then used to take necessary actions. E.g. a command like "Change mode" can be used to change the mode of camera from DAY to SMART modeor vice versa. The system only responds to owners mobile numbers. SMS received from any other mobiles will be rejected. Moreover the communication via SMS is password protected. Hence any other user too cannot control the system from one of the owner's mobile number.

III. LITERATURE SURVEY

Fast development in the technology has increased the risk of intrusion. Using security cameras allows a person to monitor his property. The majority of organization and administrations are making use of such security cameras with the intention to save their business as well as property from terrorists and illegal entry. Nowadays, the security cameras have become much more advanced, reasonable, smaller and straight forward.

A number of video surveillance systems have been proposed for different purposes. Drew Ostheimer (Drew Ostheimer*et al*., 2006) proposed an automated and distributed real-time video surveillance system which can be used for the detection of objects and events in a wide range of applications. The system captures video from multiple sources which is then processed and streamed over the internet for viewing and analysis. The proposed system is flexible as the components of the system can be interconnected in several manners. The experimental results of the system show that it can handle multiple video data running on standard computers and yielding fluid video. A number of interconnected clients can view the multiple video feeds simultaneously. Alberto Amato (Alberto Amato*et al*., 2005) proposed a semantic event detection system based on a neural classifier that screens continuous video streams and detect relevant events for video surveillance. The goal of the system

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. is to improve the awareness of security personal and decision makers by collecting real-time

information automatically. The system raises an alarm whenever unacceptable movements are detected. Hence, the system has the ability to detect mobile objects in the scene and to classify their movements (as allowed or disallowed). Wann-Yun Shieh(Wann-Yun Shie*het al*., 2009) proposed a human-shape-based falling algorithm and this algorithm was implemented in a multi-camera video surveillance system. The algorithm is implemented in real world environment for functionality proof. In this algorithm, multiple cameras are used to fetch the images from different regions required to monitor. A falling-pattern recognition approach is used to determine if an accidental falling has occurred. Also, in that case a short message will be sent to someone who needs to be alerted. Hae-Min Moon(Hae-Min Moon*et al.,* 2010) proposed the system on human identification method that uses height and clothing-colour information appropriate for the intelligent video surveillance system based on smartcard. Reliable feature information can be obtained using the smartcard. It uses octree-based colour quantization technique to the clothing region for colour extraction and height is extracted from the geometrical information of the images. The similarities between the two images are compared based on the Euclidean distance.

III. IMAGE MATCHING TECHNIQUE USED FOR THE PROPOSED SYSTEM

There are many techniques that are available for image matching and intrusion detection. In our paper, we have used a very simple algorithm to compare images for possible similarity. In our method, we are trying to perform colour image comparison using Euclidean distance and RGB colour model.

First, a standard image is stored in a separate file which is used for comparison with the captured images. New images will be captured continuously and will be stored in a different file. Each image is divided into 5x5 matrix. The RGB value of each region is calculated. The regions for comparison will be 25 RGB triples, corresponding to the average of the RGB values on the 25 regions marked in Fig 2. The image will be normalized to 300x300 pixels. No texture or variance feature will be stored, only the colour averages. Each region has 30x30 pixels.

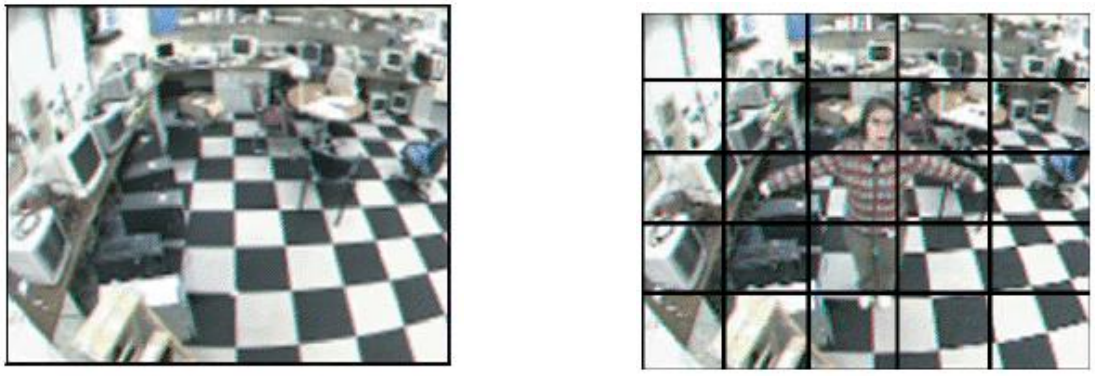
Comparison is performed on a per-region basis in that each region of standard image is compared with the corresponding region in captured image. Each of the comparisons is summed to obtain the final result.

The method to calculate the intensity similarity between the windowed areas of two images is given as:

DifferenceSquared = (standard_red - captured_red)^2 + (standard_green - captured_green)^2 + (standard_blue - captured_blue)^2

total_diff = total_diff + DifferenceSquared

output = sqrt(total_diff)



(a) (b)

Fig 2: (a) Standard image. (b) Captured image divided into 5x5 matrix.

This method is chosen because it is simple to understand and implement and can be easily modified. It combines colour (spectral) information with spatial (position/distribution) information, and is expected to be more robust (i.e. tolerant to differences) than comparing pixel by pixel or the average of the whole image.

IV. FLOW OF THE SYSTEM BEING PROPOSED

Video surveillance provides a cost-effective alternative for public safety workers to monitor activities in almost any location, without adding more feet on the street. Both fixed and mobile video services can be deployed to deliver a range of benefits to communities while increasing the efficiency and effectiveness of public safety workers.

The following diagram shows the flow of our system and the processes involved.

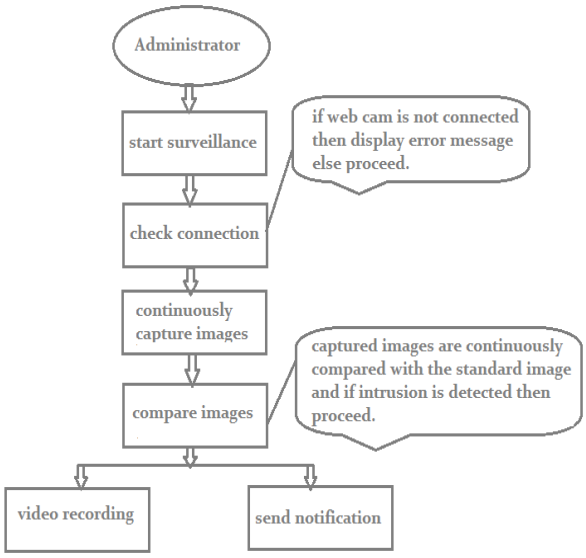


Fig. 3: Flowchart of the proposed system

The administrator starts the video surveillance system. As soon as the surveillance system is initialized, the system checks if the web camera is connected or not. If the web camera is not connected to the system then it will display an error message. Otherwise, the system continuously starts capturing images. A standard image is already stored in a separate file. The captured images are continuously compared with this standard image and are checked for any intrusion. In case of intrusion, a SMS will be sent to the administrator/owner for appropriate action to be taken. User can then login to the surveillance web application to view the most recent videos. The system waits for a specified amount of time for response commands (SMS) from any of the owners, after which it takes necessary action itself. E.g. the device starts alarming. It can store mobile numbers for all the administrators/owners who need to be contacted in case of emergency. The system keeps track/log of all the activities. Hence detailed record of messages sent and received is maintained. Administrator can send commands to control switch on/off of the device.Uer can also send a series of command sequences scheduled for a later time the commands will be executed automatically at the server when the time arrives System receives commands from administrators which are then used to take necessary actions.The commands may include Activating/deactivating a rely,setting etc. The system only responds to owners mobile numbers. SMS received from any other mobiles will be rejected. Moreover the communication via SMS is password protected. Hence any other user cannot control the system from one of the owner's mobile number. The entire Smart surveillance is made remote using this architecture

A.Benefits of Proposed System

1. Our system allows user to view videos even if he is at some remote place. The system provides the functionality of online video streaming so that user can view the videos from web browser.

2. Our system provides a software solution for image matching and intrusion detection. We do not require use of any additional hardware for this purpose.

3. Our system uses image matching technique, so it gives more precise and accurate results.

4. Entire Smart surveillance can be made remote using this architecture. User can even control the system through a remote place. He can give commands to switch on/off the system.

5. The system provides real-time monitoring. The user is notified as soon as the intrusion is detected. Thus, the user can take appropriate action without any delay.

6. Survelliance is integrated with intelligent video movement detection analysis systems combine with SMS,email alarm notification system.

V. CONCLUSION

Smart surveillance systems significantly contribute to situation awareness. Such systems transform video surveillance from data acquisition tool to information and intelligence acquisition systems. Real-time video analysis provides smart surveillance systems with the ability to react in real-time. Our system senses the intrusion and sends notifications to authorized persons so that action can be taken in response to the intrusion.

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