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# Automation in Video Security Surveillance using Mobile Remote Control

Abhishek Kumar Pandey,Aditya Ashok Kulkarni ,Shruti Jitendra Shah

[#] *Department of Computer Engineering.University of Pune, Pune,India.*

*Abstract-* **Video surveillance is observing and analyzing a particular site for safety, security and business purposes. The advancement in technology has increased the scope of such surveillance systems.**
**So far the systems used needed human invigillance. We present a new framework that is robust and efficient and would help people by providing a means of remote access to video surveillance system. It performs real time capturing, transmitting, processing and monitoring of data. Images are captured and compared for motion and intrusion detection. Whenever an intrusion is detected an SMS is sent via a phone to notify the user of application that some intrusion is detected.**
**Thus it has lots of applications in high security areas. It is also very useful for people who are out of work place and would like to keep a watch on activities that are going on in the area of his/her interest in work place.**

Keywords — GSM modem, surveillance camera, background subtraction, erosion, dilation, SMS.

## I. INTRODUCTION

Video surveillance has long been in use to monitor security sensitive areas such as banks, department stores, highways, crowded public places and borders. The advance in computing power, availability of large-capacity storage devices and high speed network infrastructure paved the way for cheaper, multi sensor video surveillance systems. Traditionally, the video outputs are processed online by human operators and are usually saved to tapes for later use only after a forensic event. The increase in the number of cameras in surveillance systems overloaded both the human operators and the storage devices with high volumes of data and made it infeasible to ensure proper monitoring of sensitive areas for long times. In order to filter out redundant information generated by an array of cameras, and increase the response time to forensic events, assisting the human operators with identification of important events in video by the use of “smart” video surveillance systems has become a critical requirement. The making of video surveillance systems “smart” requires fast, reliable and robust algorithms for moving object detection, classification, tracking and activity analysis.

So far the systems needed humans to monitor it. This project would help people by providing a means of remote access to video surveillance system. It helps in real time capturing, transmitting, processing and monitoring of data. An image as base image is kept at the video server which compares this image with the captured videos, whenever an intrusion is detected, a SMS is sent to notify the user of application that some intrusion is detected. Then the user can raise alarm, call security or take appropriate action.

## II. ARCHITECTURE

The proposed architecture consists of a server pc, surveillance camera, GSM modem, mobile phone. Surveillance camera is connected to the video server which continuously captures the images. The server has access to database.

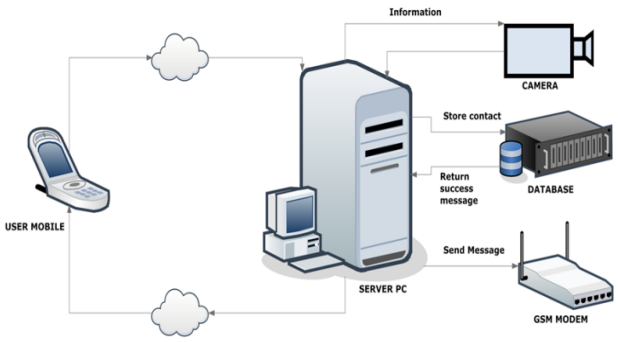



Fig 1. Architecture of Surveillance System

If the intrusion is detected, the server sends notification to the authorized users via GSM modem by SMS.A database maintains the mobile numbers of the authorized users that needs to be contacted in case of intrusion and logs of events occurred. Message sent by system will have options:

*A. Normal Mode:*
The system keeps capturing videos without notifying the user about intrusion.
*B. Smart Mode:*
The system captures video, detects motion if any and then sends a SMS for notification of the same.
*C. Call Security:*
This option is provided to user for calling the security. A number stored in phone and is dialed automatically when this option is pressed.
*D. Turn off System:*
The whole system shuts down.

The system only responds to owners mobile numbers and in addition to it, system also asks for password for authentication of the user. SMS received from any other mobiles will be rejected. Hence any other user cannot control the system from one of the owner's mobile number.

## III. LITERATURE SURVEY

The development in technology has increased the risk of intrusion. Surveillance cameras allow a person to monitor his property. Applications of such surveillance systems are wide as they help to save business as well as property from terrorists and illegal entry. The reduced size, improved performance and straight forward working has made them more popular .Variety video surveillance systems have been proposed with different uses.

Alberto Amato in 2005 proposed an event detection system based on a neural classifier which screens continuous video streams and detects all the relevant events for video surveillance. It aimed to improve the awareness of security personal and decision makers by collecting real-time. The system raises an alarm whenever unacceptable movements are detected. Thereby maintain the ability to detect moving objects in the scene.

Drew Ostheimer in 2006 proposed an automated and distributed real-time video surveillance system. The system captures video from multiple sources which is then processed and streamed over the internet for viewing and analysis. The experiments show that the system can handle multiple video data running on standard computers and yield fluid video. A number of interconnected clients can view the multiple video feeds simultaneously.

Wann-Yun Shieh in 2009 proposed a human-shape-based falling algorithm. It was implemented for multi-camera video surveillance system. In the algorithm, multiple cameras are used to fetch the images from different regions which are to be monitored. 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 alert the concerned person.

Hae-Min Moon in 2010 proposed a system for human identification which uses height and clothing-colour information by using smartcard. Reliable feature information can be obtained from smartcard. It uses octree-based color quantization technique for extraction of cloth coloring information and height is extracted from the geometrical information of the images obtained. Euclidean distance is used to find similarities between two images.

Jong Sun Kim, Dong Hae Yeom, and Young Hoon Joo in 2011 proposed an image processing technique for the video surveillance systems. They proposed a system for detection of multiple moving objects and tracking them. It could be applied to consumer electronics by using internet protocol (IP) camera and a network video recorder (NVR). It used the red-green-blue (RGB) color background modeling with a sensitivity parameter to extract moving regions, the morphology to eliminate noises, and the blob-labeling to group moving objects. To track moving objects fast, the proposed method predicted the velocity and the direction of the groups formed by moving objects. Finally, the experiments show that the proposed method had the robustness against the environmental influences and the speed, which are suitable for the real- time surveillance system

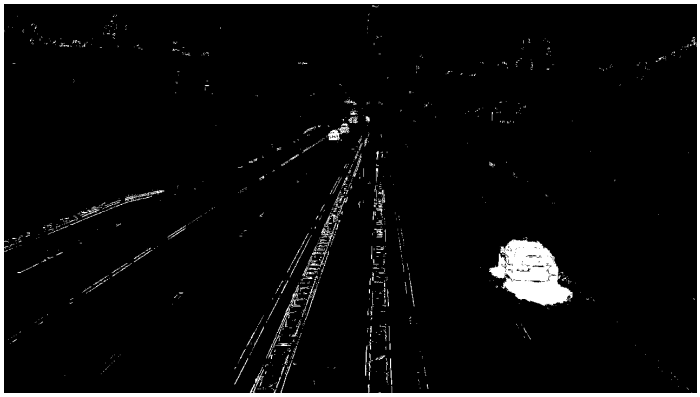
## IV. IMAGE PROCESSING TECHNIQUE

There are various methods for image matching and intrusion detection. Here, we have used a very simple algorithm to compare images for possible similarity. In our method, we have performed background subtraction using OpenCV functions followed by erosion process and dilation process. This results in background subtracted image which has less noise. Captured images are continuously processed to get desired result. Each of the comparisons is summed to obtain the final result.

For extracting the moving object from the captured video following methods are applied:

*A. Background Subtraction*: This is most common method used for extracting foreground object from background. The result of the background subtraction is a binary image shown in fig 2- (b).

a) Input image



b) Background subtracted image

Fig 2. Extraction of moving object

As background subtraction method is very sensitive to small change in background, sensitivity/threshold parameter is used to overcome this issue.

From this result, the binary output is obtained by (1) in order to perform erosion and dilation.

$$BIN_i^z = \begin{cases} 255 & ,0 < B_i^z(x,y) \\ 0 & ,otherwise \end{cases} \quad (1)$$

*B. Morphology*:

This method is used to remove unwanted noise in binary image. In this method we will be using erosion and dilation methods which are explained as follows:

*C. Erosion*:

This method removes the noise formed by the crowd of pixels in binary image after background subtraction. The result of this method is indicated in fig 3-(c).

As erosion removes the extra pixel which forms noise in the image it also affects the object of interest which is reproduced using dilation.

*D. Dilation*:

This method simply restores the pixels surrounding the object after erosion. The result after dilation is indicated in fig 3-(d).

a) result after applying erosion

b) result after applying dilation

Fig 3. Elimination of noise by erosion and dilation

## V. FLOW OF SYSTEM

Video surveillance is very cost-effective alternative for workers safety and monitors various type activities in almost any location. The flow of proposed system is shwon in fig 4.

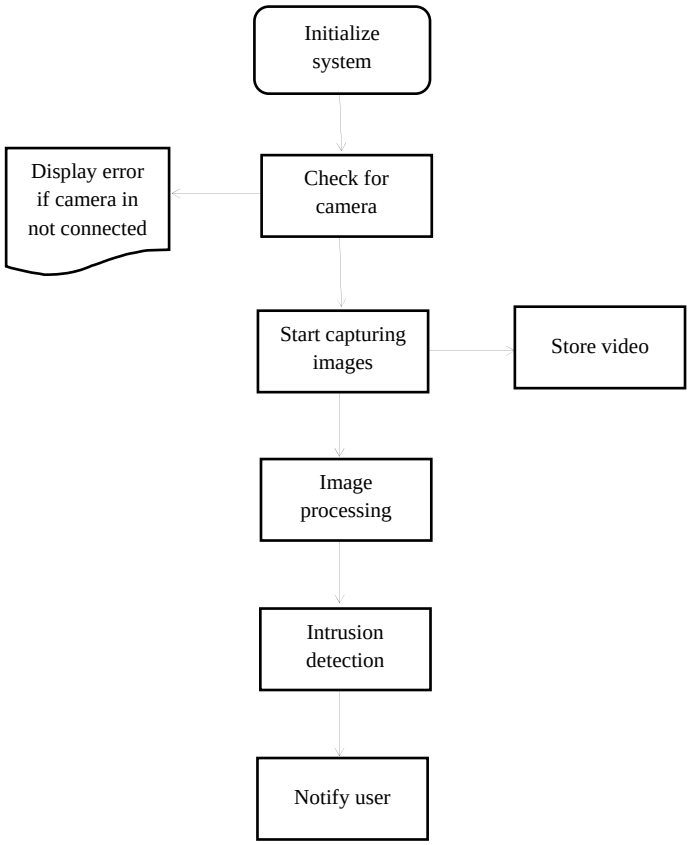



Fig 4. Flow of the system

When the surveillance system is initialized, the first thing the system does is to checks if the web camera is connected or not. If the camera is not available to the system then it will display an error message else it will continuously capture the image from camera connected to the system. These images are then processed using image processing technique and checked for any intrusion. The processing technique uses background modeling followed by erosion and dilation procedures. In case of intrusion, a notification will be sent to the administrator/owner in form of SMS for appropriate action to be taken.

User can then login to the provided surveillance application to view the most recent videos/images. 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 in database who need to be contacted in case of emergency or intrusion detection. The system also keeps track/log of all the activities for future references. Hence detailed record of messages sent and received is maintained in log.

User can send commands to switch on/off the surveillance device. System receives the appropriate command from user which is then used to take necessary actions. The commands may include activating/deactivating smart mode, send image/video, turn off system etc. The system only responds to owners mobile numbers which is present in database. SMS received from any other mobiles will be rejected and will not be taken into consideration. Also the communication via SMS between user and system 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.

## VI. CONCLUSION

The proposed system reduces human invigillance. It is more efficient than previous surveillance system as it provides mobile based remote access. The system senses intrusion in the area covered by camera and notifies the user of system about intrusion via message. Its applications are widespread.

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