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Object Detection Using Block-Based Background Method

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ABSTRACT

The goal of our system is to provide affordable and quality Surveillance system to every user. Most important feature of this System is to detect intrusion within the real time image frames and notify the user/administrator if intrusion found .In our System user use combination of various methods to detect objects in real-time video frames. In our surveillance system user have improved the performance and accuracy of detecting motion of the object as compared to existing system. IP camera provides features like remote view/remote access but it is not affordable to every user. User minimize the drawback of CCTV camera by providing remote access (real time streaming).Our system mainly focuses on minimizing the storage cost. The System is best suited for indoor security as user is monitoring a particular high security area like museum where precious and ancient arts are preserved. User/Administrator can view live streaming of the targeted area from anywhere. Our System works 24X7 and monitors the high priority targeted area and simultaneously it judges if the change is environment change or any other disturbance caused by human activity.images. Thus, object-tracking technology, which typically targets human subjects, will be implemented.In proposed system user have mentioned, Smart Surveillance technology which judges the situation and notifies the administrator immediately and responds accordingly. This System mainly focuses the area which requires higher security.The technology, which can judge the current situation in real-time by analyzing the behavioural patterns of the objects and its association with the surrounding environment, has also been studied actively.

Keywords- motion object detection, mean squared error,smart CCTV,frame difference method,adaptive background subtraction method,video signal processing,frame difference method.

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I. INTRODUCTION

Video Surveillance and its installation are increasingly being used in public facilities and organizations, as part of an effort to achieve security. The environments monitoring has been expanded to protect residents in places, such as elementary schools and other care facilities.The installation of the Video Surveillance helps in preventing crime and may aid in the solution of cases. Its role is also increasing in various forms. In addition, Video Surveillance has been used for purposes, such as crime prevention and detection. It also gives high security which is very important now days. The most important technique of this smart Surveillance is to track and analyze objects within the.The core technology of smart surveillance system analysis is used in detecting, analyzing, and tracking the object's motion. However, the object, which is the target to be traced, can vary, depending on the situation, such as image size, orientation, and location, within consecutive frames. In addition, when the light's color or direction changes, it is difficult to trace the object, as it is perceived as another object, even though it is the same object as in the previous frame.

MODULES OF THE PROJECT:

MODULE 1:

1. Capture Image:
Input: Camera ID
Output: Captured Image
In this module we provide camera ID and get an image as output.System will set or record the targeted area. This will store Captured image through Frame Difference Method. Number of captured images get converted into video and video recording is started.

2.Capture Video:
Input: Camera ID
Output: Captured Video
In this module we provide camera ID and get video as output. If any suspicious activity is detected in the targeted area or any intrusion is detedcted in the system then system can record the video of the activity using block Based Background Method. User can view any recoringat any time anywhere using user's authenticated android mobile phone.

3.Compare Image:
Input: Captured Image
Output: Difference in capture image and template image.
Here in this module we will get difference in captured images and template images.Selected target area is compared with the current image frame region and analysis is done on it. If mismatch is found, play an alarm and send notification to an authenticated Android Phone via SMS & plays alarm.

II. LITERATURE SURVEY

Moving object detection method shows high performance with regard to the MSE(Mean Squared Error) and the accuracy of detecting the moving object contours compared to other existing methods[2]. In general video surveillance system, video streams from cameras are sent to a control center and operators monitor the videos.But human operator monitoring of every moment is almost impossible, so smart surveillance system is required. This paper assumes the objects are correctly detected and located during video preprocessing[1][3]. A lot of research has been done in the area of camera selection in a camera-based wireless network. In case of camera sensors, the complexity of coverage issue increases as three dimensional coverage of space is required[4].

III.EXISTING SYSTEM

The long-term storage and archiving of cctv recordings is an issue of concern in the implementation of a cctv system. re-usable media such as tape may be cycled through the recording process at regular intervals. there are statutory limits on retention of data. Recordings are kept for several purposes. Firstly, the primary purpose for which they were created (e.g. to monitor a facility). Secondly, they need to be preserved for a reasonable amount of time to recover any evidence of other important activity they might document (e.g. a group of people passing a facility the night a crime was committed). Finally, the recordings may be evaluated for historical, research or other long-term information of value they may contain (e.g. samples kept to help understand trends for a business or community).Recordings are more commonly stored using hard disk drives in lieu of video cassette recorders. The quality of digital recordings is subject to compression ratios, images stored per second, image size and duration of image retention before being overwritten. Different vendors of digital video recorders use different compression standards and varying compression ratios.

IV.PROPOSED SYSTEM

The software can sense intrusion. The streamed video (5 sec delayed) can then be sent to administrator/owner for appropriate action to be taken. Administrator can send commands to control switch on/off of the device. The entire home surveillance can be made remote using this architecture.It can store mobile numbers for all the administrators/owners who need to be contacted in case of emergency. Software can manage numbers according to situation or priority. E.g. In case of intrusion, a SMS will be sent to the individual, 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.The system keeps track/log of all the activities. Hence detailed record of messages sent and received is maintained. Also a detailed track of all the activities (rise/fall in temperature, intrusion detection, etc.) is also maintained.

V. ARCHITECTURE OF THE SYSTEM

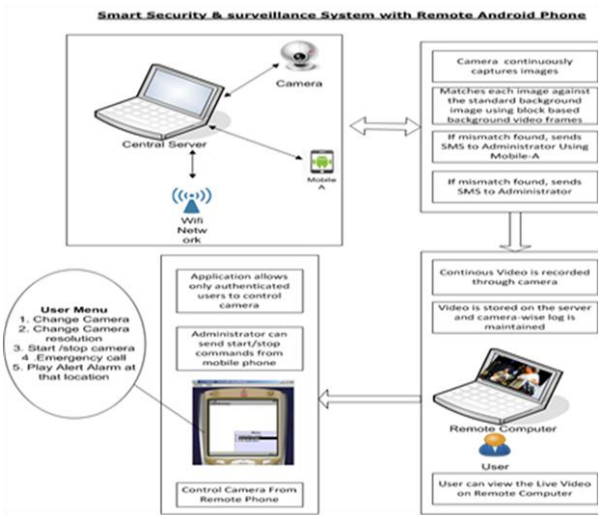

Fig.1: Architecture of the system

System can start and stop camera using OpenCV functions and it is also takes place video recording using OpenCV. Image Comparison and Intrusion detection comparison is campared using block based motion object detection method. It can store mobile numbers for all the administrators or owners who need to be contacted in case of emergency. Also User can change camera using his mobile phone.The system plays an alarm after detecting intrusion. user can also play it again and again using its mobile phone. The system keeps track or log of all the activities.Detailed record of messages received is maintained using this system and

also a detailed track of all the activities (intrusion detection, etc.) is also maintained.The system only responds to owners mobile numbers and action received from any other mobiles will be rejected.

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B:Methods

1. Frame Difference Method (FDM)

It is the method to detect moving objects. This method processes the difference between the current and the previous image frame. The formula used for this method is as fallow:

$$D_n(x,y) = \begin{cases} 1, & |F_n(x,y) - F_{n-1}(x,y)| > t_T \\ 0, & otherwise \end{cases}$$

Where,
n= Current Frame Number,
F= Frame of image,
x, y= Coordinates on frame,
tT =Threshold value of motion,
D= Image contains information of area in which motion is detected.
By using this formula Absolute value is taken. If this Absolute value is greater than threshold value then it is recognized pixel with motion otherwise motion is not present in that particular area. This method requires short processing time. One disadvantage of this method is that it is not relative to noise and it recognize object motion even if noise or light in area.

2.Background Subtraction Method (BSM)

It is method to detect moving object through subtraction from background image for every frame currently taken.

$$D_n(x,y) = \begin{cases} 1, & |F_n(x,y) - B(x,y)| > t_T \\ 0, & otherwise \end{cases}$$

Where,
n= no. of current frame,
F= Frame of image,
x, y= Coordinates on frame,
tT =Threshold value of motion,
B= Background image.
By using this formula absolute value is taken. If this value is greater than threshold value then pixel with motion otherwise pixel does not have motion. If screen transitions takes place rapidly the moving object cannot be detect rapidly. To solve such problems Adaptive Subtraction method is used.

3. Adaptive Background Subtraction Method (ABSM)

It is used to find moving object by calculating difference between current frame and background frame. Following formula used to obtain background image:

$$B_{n+1}(x,y) = \alpha F_n(x,y) + (1-\alpha)B_n(x,y)$$

Where, Alpha= Rate of Learning. Following formula is used for obtain an image by subtraction between image drawn by earlier formula

$$D_n(x,y) = \begin{cases} 1, & |F_n(x,y) - B_n(x,y)| > t_T \\ 0, & otherwise \end{cases}$$

In formula if alpha is greater, then color values of recent frames are reflected and if aloha is lower the adaption of background image generate at much slower rate. It is time consuming to generate the background image. In this paper we describe new technique which combines FDM and BSM and solves the problems in FDM, BSM and ABSM.

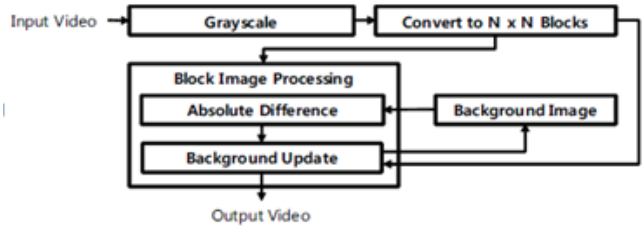
VI. ALGORITHM

Object detection using block based background subtraction image.

A. Motional Region Detection Structure:

The new motion detection method we proposed uses a technique like BSM. That is, it uses the subtraction between the current frame image and the background image. The background image used at this time is not a background image prepared in advance. However, it creates the background screen in real-time when video shooting. The motion detection method proposed in this study can divided into three steps:

a. blocking the input image and preprocessing the image by block zoning
b. obtaining the difference image between the background image and block zoning
c. Updating the background image.



In Figure, the initial input image is a TV input method proposed in the NTSC standard. This is the YIQ method. It is converted to grayscaleusing following formula. Herein, F represents the frame image, and r, g, b indicates Red, Green, Blue value, respectively, to the pixel corresponding to the position of x and y.

$$\begin{aligned} G(x,y) &= 0.299 \times F_r(x,y) + 0.587 \times F_g(x,y) \\ &+ 0.114 \times F_b(x,y) \end{aligned}$$

The images obtained after converting to grayscale are segmented into the square block with the entire number of pixels, *N*. Subsequently, the absolute difference image of the block is divided in the front using formula.

$$D_n(x,y) = \begin{cases} 1, & |W_n(x,y) - B_n(x,y)| > t_T \\ 0, & otherwise \end{cases}$$

$(x, y=0,1,2,.....,N\text{-}1 \qquad N$: window block size)

In above formula, *n* represents the number of blocks, *W* the block corresponding to the current image, *B* the block

corresponding to the background image, and *D* the value of the absolute difference between *W* and *B*.

B. Background Image Update:

Step 1: One-dimensional array is declared to store each difference image luminance change rate by block R(n), and initialized to 0. This step is performed only once during the first run.

Step 2: Integer variable C to calculate the degree of change for the entire block is declared and initialized into 0. Here in, C represents the number of blocks with a change. For the block difference image (Dn). Steps 3 and 4 are performed repeatedly.

Step 3: The number of pixels that have 1 as a value within the block difference image (Dn) is put together. At this time, the sum of pixels represents the change in the luminance within the block. If it is equal to or greater than t, it is considered to have a change in the movement in the block, and the value of R(n) increases by 1. In addition, the value of C increases by 1. Conversely, if the sum of the pixels is less than

t we consider there is no change, the value of R(n) reduces by 1,and all the values of Dn are initialized to 0. The image with no change in the luminance value in the block is initialized into0 to eliminate noise. Herein, t uses an arbitrary threshold value i.e. block size N.

$$R(n) = \begin{cases} R(n)+1, & C = C+1, \quad \sum_{k=0}^{N^2} D_n(k) > \Delta t \\ R(n)-1, & D_n = 0, ..., 0., \quad otherwise \end{cases}$$

Step 4: In above formula, if the value of *R*(*n*) is less than '-1',the background image of the block is updated. Otherwise, it is not updated and remains as the previous background image.

VII. EXPERIMENT RESULTS

In this experiment we use the background subtraction algorithm for the detection of the moving object in the surveillance area.

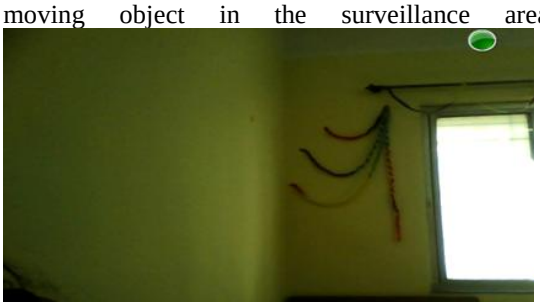


Fig (a) Initial Image

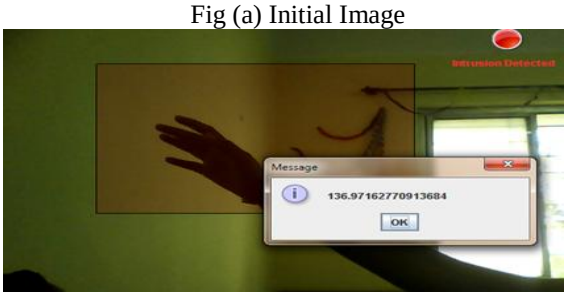


Fig:- (b) Output Image

Here the initial image is initialized in the code and then the subtraction of the current frame is done. And after the subtraction of the both frame the subtracted image is display on the screen. The following figure shows the initial image and the subtracted image. The subtracted image shows the intrusion detected and also show message. The video gets subtracted from the initial image. The initial image is nothing but the background image in which the object is not present. The Fig(a) shows the initial image which is initialized as the background image. This image is referred as background image because there is no any moving object. Background image is not fixed and it must adapt to motion changes like tree branch move, changes in background because of objects entering in a scene, stay for longer period without motion.The Fig (b) shows the output image in which the moving object is detected. Also intrusion is detected and message will show.

VIII. CONCLUSION

CCTVs are been widely used in various places like Museum ,Shopping Malls and many other areas due to the increased needs for security. CCTVs are also used in school zones to prevent social problems, such as the sexual abuse of woman and children. Existing CCTVs can record object with motion along with motionless object. A person has an authentication to take actions whenever any intrusion is detected. CCTV technology uses sensors to sense and judge the situation for itself and take immediate action if needed. This study examines the core technology that traces and analyzes a moving object. The proposed a motion detection method using background subtraction image that combines both FDM and BSM. The method proposed in this study did not have much calculation in terms of arithmetic and showed a slight inferiority compared to the other three methods in terms of processing time and memory usage to store change rate. The main advantage of Block-based background Method is it uses Frame Difference Method, Adaptive Background Subtraction Methods.

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