Java Based Video Surveillance System Using Frame Separation In Real-Time

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***Abstract*—** *This paper enables us to do 24x7 video surveillance a specified area and alert the end user in real time. conventional surveillance system requires a person to monitor the video, It also takes huge storage capacity and lack computation capability during monitoring. We aim to overcome these cons of the existing system by creating a real time video surveillance system. This system is used in the area where on one is allowed without permission. Our methodology aims to detect the moving object and segment objects supported motion information and alert the end user. For this we planned a pixel wise background modeling which compares the background image with the foreground image.*

Background image: Which is initially stored once the webcam is turned on

Foreground image: Which are captured by the webcam after the background image is stored and these are compared with the Background image to get the status.

It uses pattern recognition algorithm for the complex comparison process between two images. After the comparison operation if an moving object is detected and if the threshold value is over the specified limit then interrupt will be send to the end user's mobile device using a GSM modem.

Keywords — *Moving Object Detection, Pixel, Background Subtraction, Background Image, Foreground Image, GSM Modem.*

I. INTRODUCTION

Surveillance is the observation of activities principally used to monitor outlaw activities. surveillance is the method of observation of individuals, objects or processes within systems for adherence to expected or desired normal in trusted systems for security. Visual surveillance has attracted much attention in the computer vision community due to its potential applications. In video surveillance system, human operator responsible for monitoring does all task while watching the videos coming from the different cameras. It's a difficult job of an worker to monitor the multiple screen and at the same time to be lookout for any illegal or unwanted event. These systems are not worthy for large crowded places as the number of cameras exceeds the capacity of human experts. Such systems are used in widely used across the world. Therefore the aim of visual surveillance is not only to put cameras in the place of human eyes, but also to accomplish the entire surveillance task as automatically as possible. The usual approach to moving object detection is through background subtraction that consists in maintaining an up-to date model of the background and detecting moving objects as those that vary from such a model. The problem with background subtraction is to automatically update the background from the current video frame and it should be able to withstand and overcome the following problems :

• Illumination changes: The background model should be able to adapt, to gradual changes in illumination over a period of time.

• Moving background: Non-stationary background regions, such as branches and leaves of trees, a flag waving in the wind, or flowing water, should be identified as part of the background.

• Shadows: Shadows cast by moving object should be identified as part of the background and not foreground.

• Bootstrapping: The background model should be able to maintain background even in the absence of training background (absence of foreground object).

• Camouflage: Moving object should be detected even if pixel characteristics are same to the background.

In proposed system we are presenting a Moving Object Detection by Detecting Contiguous Outliers in the generic algorithm which is used for efficient object detection.

In proposed system we are using Pattern recognition algorithm and we are taking video as input.

II. LITERATURE SURVEY

A. Real-Time Moving Vehicle Detection with Cast Shadow Removal in Video based on Conditional Random Field Yang Wang, Member, IEEE 2013.

This paper presents a general trainable framework for object detection in static images of cluttered scenes. The detection technique we develop is based on a wavelet representation of an object class derived from a statistical analysis of the class instances. By learning an object class in terms of a subset of an over complete dictionary of wavelet

basis functions, we derive a compact representation of an object class which is used as an input to a support vector machine classifier.

B. Automatic Fish Classification for Underwater Species Behaviour Understanding Concetto Spampinato, Daniela Giordano, Roberto Di Salvo Department of Informatics Telecommunication Engineering - University of Catania. Year 2013.

Background maintenance, though frequently used for video surveillance applications, is often implemented ado with little thought given to the formulation of realistic, yet useful goals. We presented Wallflower, a system that attempts to solve many of the common problems with background maintenance.

C. Fish Recognition based on Robust Features Extraction from Colour Texture Measurements using Back-Propogation Classifier Mutasem Khalil Alsmadi1, Khairuddin Bin Omar2, Shahrul Azman Noah3, year 2010

In this paper we have proposed a technique for the modeling dynamic scenes for the purpose of background foreground differentiation and change detection. Theme relies on the utilization of optical flow as feature for change detection. In order to properly utilize the uncertainties in the feature, we proposed a novel kernel based multivariate density estimation technique that adopts the bandwidth according the uncertainties in the test and sample measurements.

D. Detecting, Tracking and Counting Fish in Low Quality Unconstrained Underwater Videos Yun-Heh Chen-Burger , Gayathri Nadarajan, Robert .B, year 2015.

In this paper, we proposed a more principled and general method for face recognition with contiguous occlusion. We do not assume any explicit prior knowledge about the location, size, shape, color or number of the occulated regions; the only prior information we have about the occulation is that the corrupted pixels are likely to be adjacent to each other in the image plane.

E. Motion Competition: A Variation Approach to Piecewise Parametric Motion Segmentation Meng-Che Chuang, Jenq-Neng Hwang, Kresimir Williams, and Richard Towler IEEE 2014.

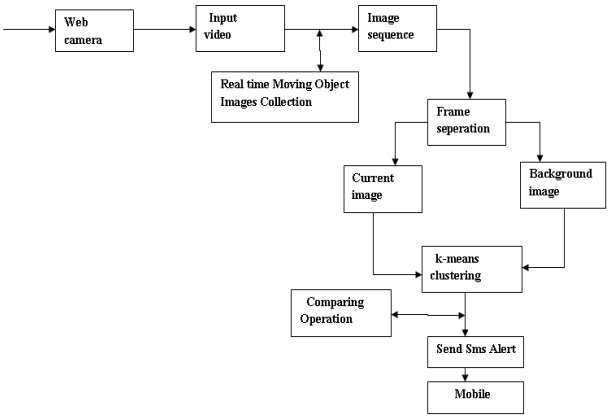
In this paper, we address the problem of tracking an object in a video its location in the frame and no other information. Recently, a class of tracking techniques called “tracking by detection” has been shown to give promising results at real-time speeds. These methods train a discriminative classifier in an online manner to separate the object from the background. This classifier bootstraps itself by using the current tracker state to extract positive and negative examples from the current frame.

F. An Implementation of Tracking and Detecting Fish from Videos using Adaptive Gaussian Mixture Model Guru Kashi University, Talwandi Sabo, Punjab, India IEEE 2015.

That purpose two different representations of this motion boundary: An explicit-based implementation which can be applied to the motion-based tracking of single moving object, and an implicit multiphase level set implementation that permits for the segmentation of an arbitrary number of multiply connected moving objects. Numerical results both for simulated ground truth experiments and for real world sequences demonstrate the capacity of our approach to segment objects primarily based exclusively on their relative motion.

III.SYSTEM DESIGN

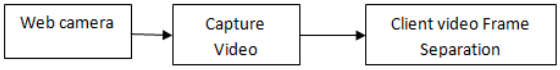
A. SYSTEM ARCHITECTURE DIAGRAM



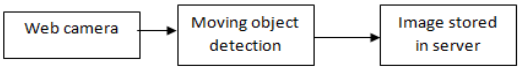
The system architecture contains 4 different modules which is explained below:

B. MODULES

1) Video Capturing: Digital video refers to the capturing, manipulation, and storage of moving pictures that can be displaced on laptop screens. First, a camera and a mike capture the image and sound of a video session and send analog signals to a video-capture adapter board.



2) Moving Object Detection: After the video capturing process is done the first frame from the video input is stored as background for the algorithm which is stored in the database initially. Then, the moving object detection process is initiated. If there is any movement recognized by the camera inside the surveillance area the system will instantly capture the frame and send it to the server.



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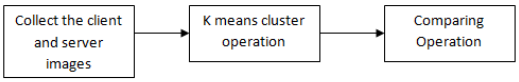
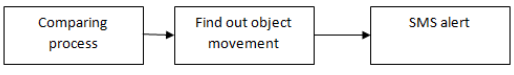
3) Comparison Operation: Background subtraction is the initiative in the process of segmenting and tracking individuals. Distinguishing between foreground and background is a very dynamic and unconstrained outdoor atmosphere over many hours is a difficult task. The background model is unbroken in the information storage and four individual modules do coaching of the model, updating of the model, foreground/background classification and post processing. The primary k video frames are used to train the background model to achieve a model that represents the variation in the background during this period. the subsequent frames (from k + one and onwards) are each processed by the background subtraction module to produce a mask that describes the foreground regions identified by comparing the incoming frame with the background model. data from frames k + one and onwards are used to update the background model either by the continual update mechanism, the layered updating, or both. The mask obtained from the background subtraction is processed further in the post process module that minimizes the result of noise in the mask.



4) SMS Alert Message: After sleuthing the changes in video frames, we are alerting the central management unit or the user through SMS using the GSM modem. A GSM modem is a wireless electronic equipment that works with a GSM wireless network. A wireless electronic equipment behaves like a dial-up modem. the main difference between them is that a dial-up modem sends and receives information through a set telephone line whereas a wireless modem sends and receives information through radio waves. Typically, an external GSM modem is connected to a laptop through a serial cable or a USB cable. like a GSM movable, a GSM modem needs a SIM card from a wireless carrier so as to operate.



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IV. ALGORITHM

The algorithm used here has 4 different stages as we mentioned earlier in the system architecture namely video capturing, moving object detection, comparison operation and finally the sms alerting.
Firstly, the webcam is recognized by the system once the program starts running the file webcam. The camera is turned on and the system starts monitoring the surrounding and the background frame is identified from the video input. Then, it moves on to test motion detection where the program is used to find the moving object. If there is no object detected then the background remains still in the server but once the object is detected it instantly it changes the old background frame with the newly obtained frame. After that the comparison operation takes place where the old background frame is compared with the new background frame by using the k-means clustering operation of the pixels from each frame.

Algorithm (K-means clustering)
begin initialize n, c, µ1, µ2,..., µc
do classify n samples according to nearest
recompute µi
until no change in µi
return µ 1 , µ2,..., µ c
end

A matrix is formed from the pixels of each frame respectively then the matrices will undergo the pattern recognition process and finally we obtain an threshold value. If the obtained threshold value is within the threshold limit we initialized earlier then the system will be ideal i.e it won't send any alert message to the end user but the obtained threshold value is beyond the limit then the interrupt will be send to the end user.

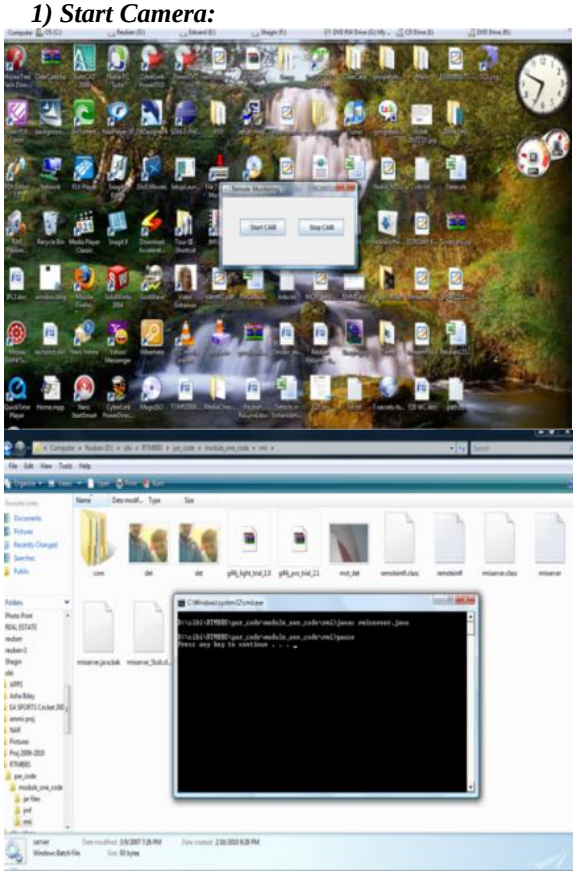
This is the complete pseudo code of the algorithm for your reference:
S = **IMG**(I)
1: A= fg
2: for each color channel map f_k(I) : k = 1; 2; 3g in Lab space
3: for _ = 0 : _ : 255
4: B = **THRESH**(_k(I); _)
5: e B = **INVERT**(A)
6: add **OPENING**(A; !o) and **OPENING**(e B; !o) to B
7: for each Bk 2 B
8: Ak = **ZEROS**(Bk:size())
9: set Ak(i; j) = 1 if Bk(i; j) belongs to a surrounded region
10: Ak = **COMPARE**(Ak; !d1)
11: Ak = **NORMALIZE**(A)
12: A_ = 1
n
Pn
k=1 Ak

13: S = **INTERRUPT**(A_)
14: return S

V. IMPLEMENTATION

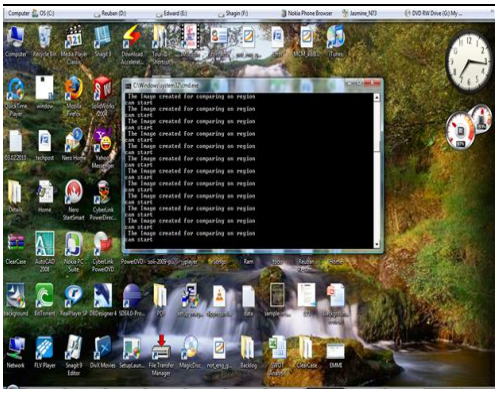
The implementation of this idea requires a administrator who is responsible for the system. The administrator first needs to start the system using the server and from the client side the same administrator needs to start the process by clicking the button "START CAM", once the camera is opened the administrator as nothing to do with the system. The rest of the process will carry on by itself.

1) Start Camera:

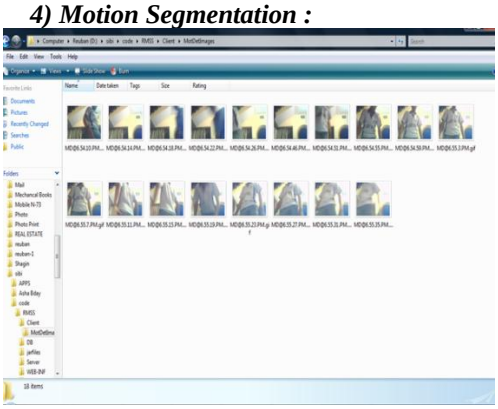


2) Video Capturing:

3) Motion Detection:



4) Motion Segmentation :



5) Final Message:

VI. PERFORMANCE AND STORAGE COMPARISON

While comparing the existing normal video surveillance system with our real time video surveillance system the performance have been increased to 20% higher than the existing system. The maintenance of the surveillance system is almost reduced into half which in term increases the efficiency. At the same time we need only 35% of storage capacity from the existing normal video surveillance.

VII. CONCLUSION

The primary objective of this paper is to create a real time surveillance system which alerts the management instantly after an attempt made to enter the premises illegally (i.e) it has the computation capability while monitoring. It also aims to reduce the storage and increase the efficiency of a normal video surveillance system.

VIII. FUTURE WORK

The future of real time surveillance will be based on the implementation of a widely accepted system for all type of video surveillance in almost all sector which needs video surveillance. As improvements will be made further in the system more sectors will be willing to adapt to the system that works much more efficiently and effectively than the existing system. It is not only important to implement a new system, upgrade has to be made constantly for the years to come. Other sectors who seek high end security systems will not jump into a new technology without seeing that this technology is well worth the effort made and the money invested to put this system in use. It usually takes some number of firms to implement the new technology and spread the word to peoples in same and different sectors that this new
technology. This technology also needs to have some technicians who will be there to help if any problems arise in implementing and using the technology.

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