An Effective Object Detection Video Surveillance and Alert System

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ABSTRACT
Traditional video surveillance takes a huge amount of storage space. Recording everything captured by a surveillance camera consumes the large storage space and hence limits the duration of video that can be stored. In addition, recording everything makes it time consuming for a human to review the stored video. Mounting video cameras is cheap, but finding available human resources to monitor the output is expensive. All these disadvantages limit the effectiveness of traditional video surveillance.To solve these problems, recording only crucial images that contains important information is the only way. Identifying moving objects from a video sequence is a fundamental and critical task in many computer vision applications. We will be using SOBEL filter which comes under edge detection algorithms, and creates an image which emphasizes edges and transitions. Nowadays, the size of storage media increases day by day. Although the largest capacity of hard disk is about 2 Terabytes, it is not enough large if we store the video file without compressing it.[6] Image Compression aims to describe the process of storing the image with less number of bytes in digital memory by removing the redundancy from the image. Digital Images are stored with BMP, TIFF, GIF, JPEG formats. So to overcome these disadvantages we are proposing an effective object detection and video surveillance system. Video surveillance has found its importance for security purpose in every industry throughout the past several years, especially where the safety is of utmost importance.

Keywords
Object detection, real time video surveillance, edge detection, alert message system, SOBEL filter, motion detection.

1. INTRODUCTION
Modern video surveillance systems gained attention in the wider community of computer vision more than a decade ago. Today, the issue receives more intense pursuit from the narrower but more focused visual surveillance community. Automated video surveillance systems constitute a network of video sensors observing people as well as other moving and interacting objects in a given environment for patterns of normal/abnormal activities, interesting events, and other domain specific goals. On the other hand, the problem of robust object detection and tracking is even harder to address given the requirement that the video surveillance systems have to operate in widely varying weather conditions and all time periods. This situation of high performance expectations and stringent requirements places a minimal margin of error on the performance of these video surveillance systems.[8]

The objective of paper is to describe the development of an intelligent surveillance system for urban security in an academic environment. This prototype system incorporates a wide range of advanced surveillance techniques real-time moving object detection and tracking from stationary camera platforms, recognition of generic object classes and specific human abnormal behavior triggering an alarm, object pose estimation with respect to a geospatial site model, camera control and multi camera cooperative tracking, human activity recognition and analysis, recognition of simple multi-agent activities, real-time data dissemination, data logging and dynamic scene visualization.[1] The proposed architecture takes advantage of time-varying data from multiple cameras to obtain point correspondences and perform robust calibration. It tracks a moving object in the scene and uses its location at every time step as a single point correspondence among multiple cameras.

There are immediate needs for automated surveillance systems in commercial, law enforcement, and military applications. Mounting video cameras is cheap, but finding available human resources to observe the output is expensive. [11]Although surveillance cameras are already prevalent in banks, stores, and parking lots, video data currently is used only “after the fact” as a forensic tool, thus losing its primary benefit as an active, real-time medium. What is needed is continuous 24-hour monitoring of surveillance video to alert security officers to a burglary in progress or to a suspicious individual loitering in the parking lot, while there is still time to prevent the crime.

2. PRPOSED SYSTEM
To solve these problems, recording only crucial images that contains important information is the only way. This project uses a robust motion detection algorithm for real-time motion detection by considering information, i.e., image that contains motion in the scene. This can be done with a web camera and a motion detection algorithm[3] that detects motion. The motion detection algorithm robustly distinguishes motion from lighting changes. Web camera can take the snapshot of the moving object and at the same time, it will activate the warning system before storing the frames on the memory.[4]

Identifying moving objects from a video sequence is a fundamental and critical task in many computer vision applications.[7] Proposed System uses SOBEL filter which comes under edge detection algorithms, and creates an image which emphasizes edges and transitions. The SOBEL operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations.

3. SYSTEM ARCHITECTURE

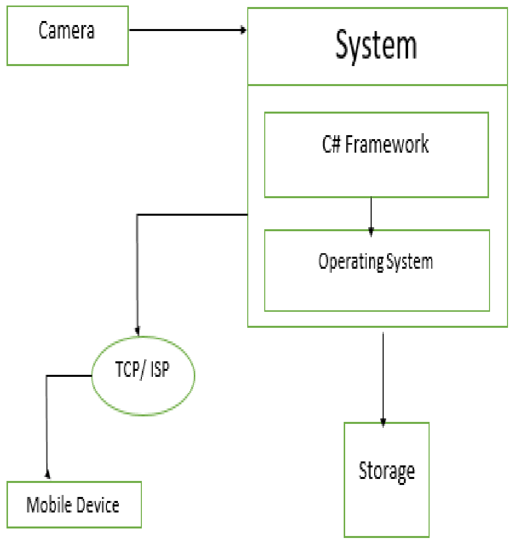

Fig.1. ARCHITECTURE

4. MATHEMATICAL MODULE

We have an algorithm that will analyze and classify video frames captured from surveillance camera help of some parameters like edge of object, gesture variations of object in that frame. Classification is based on whether object satisfies with given parameters or not. One way to do this is by iterating through all over video frames and keeping track object movement in each frame. Every time Algorithms compare current frame with previous frames and if it found difference between parameters in then there is motion detection.

Let us say there are n frames. For every frame the algorithm has to perform a constant number of

Operations. Therefore we can say that the algorithm runs in O(n) time, Or that the runtime is a Linear function of how many parameters to compare.

Let S be the system where

S= {Fr, Ed, Md, C}

Where,

Fr = Set of frames

Ed = Edge detector

Md = Motion detector

C = Camera

Fr = f1, f2, f3…………….fn

Edi = only one edge detector

Md = only one Admin

Cl = c1, c2, c3…………..cn

So the formulation of algorithm represented as

f (Fr) -> C

f (Ed) ->Fr

f (Md) ->Fr

Threshold value = change image/original pixel

5. EDGE DETECTION ALGORITHM

Edge detection is the first step to recover information from images. Edges are the significant local changes of intensity in an image. Edges typically occur on the boundary between two different regions in an image. [3]Edge also can be defined as discontinuities in image intensity from one pixel to another. A typical edge detector has the following steps:

a) It suppresses noise as much as possible, without destroying the true edges;

b) It applies a filter to enhance the quality of the edges in the image,

c) It determines which edge pixels should be discarded as noise and which should be retained,

d) It determines the exact location of an edge.

6. GRAY SCALE CONVERSION

A grayscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest.[13] To convert any color to a grayscale representation of its luminance, first one must obtain the values of its red, green, and blue (RGB) primaries in linear intensity encoding, by gamma expansion.[6]

7. SOBEL FILTERING

The SOBEL operator performs a 2-D spatial gradient measurement on an image and so emphasizes regions of high spatial frequency that correspond to edges. [15] Typically it is used to find the approximate absolute gradient magnitude at each point in an input grey-scale image.

Input:A Gray-scale Image

Output:Detected Edges

Step 1: Accept the input image

Step 2: Apply mask *Gx*, *Gy*to the input image

Step 3: Apply Sobel edge detection algorithm and the gradient

Step 4: Masks manipulation of *Gx*, *Gy*separately on the input image

Step 5: Results combined to find the absolute magnitude of the gradient

$$|G| = \sqrt{Gx^2 + Gy^2}$$

Step 6: the absolute magnitude is the output edges

8. VIDEO STORAGE , ALARM AND E-MAIL

This module is started with the help of thread. It is enabled as soon as there is motion in the scene. The video is stored in Windows Media Video (.wmv) format so as to make it compatible with most of the video players.The quality of the video is completely dependent on the camera used while the size of the video is dependent on both quality of camera as well as the time for which the motion is present in the scene.The alarmmodule is started using a thread which will enable the system to run this module simultaneously with video storage module.E-mail feature will be activeif the system is connected to the internet.

9. ALGORITHM

Input: Live Video Stream/Offline Video Stream

Output: Detected Objects

Step 1: Start

Step 2: Input Video

Step 3:Divide video in frames f1,f2….fn

Step 4: Convert grayscale

Step 5: Take first frame f1 and compare it with next frame f2

Step 6: Compare both images using histogram

Step 7: If changes found calculate the changed area

Step 8: Apply SOBEL filtering

Step 9: Detect object

Step 10: Else go to next frame

Step 11: End.

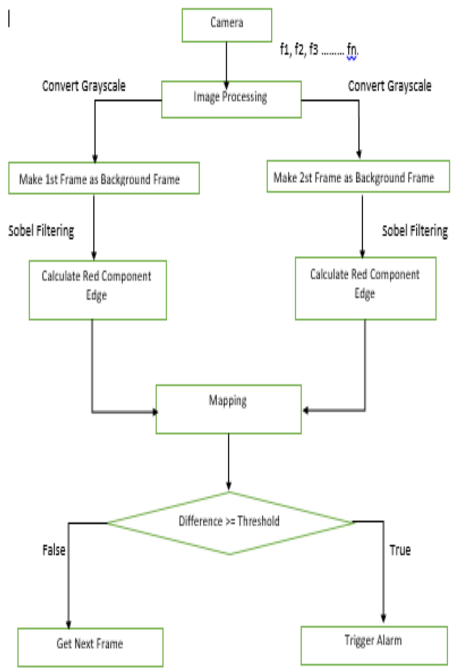

Fig.2. Work Flow

10. EXPERIMENTAL RESULTS

Table 1. Result Comparison

Sr. No.	**Containt**	**Our System**	**Previous System**
1	Time	Less	High
2	Storage	Less	High
3	Frames/Sec	30-50 Hzs	15-30 Hzs

11. CONCLUSION

In this paper, real time moving object detection system based on the improved edge detection algorithm and SOBEL filtering was presented. Simulation results indicate that the proposed system consistently performs well under differentillumination conditions including indoor, outdoor, sunny, and foggy cases. Moreover, it outperforms well known edge based method in terms of detecting moving objects and error rate. These results demonstrate that the proposed system can be a suitable candidate for moving object detection in real time video surveillance system.

Thermal positioning and Geospatial location determination improves system performance. The examination of use of a motionfor activity recognition and trackingsystem .[16] One can also add a detection scheme for dropped objects and objects newly appearing in the scene.

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