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# MOTION DETECTION USING FRAME SUBTRACTION METHOD

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## ABSTRACT

Movement is the act or process of moving a object or person .The movement system provides a continual care and the movement of persons from the site. we can use the this system anywhere in homes, hospitals, malls, banks and at any public place, where we want to detect the movement. In the security systems like in banks we can use the movement detection systems to prevent from theft.In the Elevator system we can detect the unusual movement by the person or object.. In our research work we detect the motion from video files as well as with the help of camera. In our research work, video is captured using a stationary camera. The selection of the model of a camera is an important aspect of any changes detection algorithm. We use a single camera that is fixed to our pc. We take low quality and high quality videos from two different cameras as input. we run both the low quality as well as high quality video on the proposed system for taking result as output. Proposed system shows the accuracy of 94% where as the existing system shows the accuracy of 89%.Hence it is concluded that the proposed system shows better results as compared to the existing system. Experiments have shown that this method produces accurate results with providing the movements in real time video and in video as input.

**KEYWORDS**: Motion Detection, Movement Detection, Frame Subtraction Method, Modified Frame Subtraction Method, Video surveillance.

## 1. INTRODUCTION

Motion detection in consequent images is nothing but the detection of the moving object in the scene. In video surveillance, motion detection refers to the capability of the surveillance system to detect motion and capture the events. Motion detection is usually a software-based monitoring algorithm which will signal the surveillance camera to begin capturing the event when it detects motions. This is also called activity detection. An advanced motion detection surveillance system can analyze the type of motion to see if it warrants an alarm. In this project, a camera fixed to its base has been placed and is set as an observer at the outdoor for surveillance. Any small movement with a level of tolerance it picks is detected as motion. Aside from the intrinsic usefulness of being able to segment video streams into moving and background components, detecting moving blobs provides a focus of attention for recognition, classification, and activity analysis, making these later processes more efficient since only "moving "pixels need be considered. There are three conventional approaches to moving object detection [3]:temporal differencing, background subtraction and optical flow. Temporal differencing is veryadaptive to dynamic environments, but generally does a poor job of extracting all relevant feature pixels. Background subtraction provides the most complete feature data, but is extremely sensitive to dynamic scene changes due to lighting and extraneous events. Optical flow can be used to detect independently moving objects in the presence of camera motion; however, most optical flow computation methods are computationally complex, and cannot be applied to full-frame video streams in real-time without specialized hardware [3].

**Motion in real time environment: problems**

Video motion detection is fundamental in many autonomous video surveillance strategies. However, in outdoor scenes where inconsistent lighting and unimportant, but distracting, background movement is present, it is a challenging problem. In real time environment where scene is not under control situation is much worse and noisy. Light may change anytime which cause system output less meaningful to deal with. Recent research has produced several background modeling techniques, based on image differencing, that exhibit real-time performance and high accuracy for certain classes of scene. The aim of this research work is to assess the performance of some of these background modeling techniques (namely, the Gaussian Mixture Model, temporal

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differencing, the Hybrid Detection, shadow detection and removal Algorithm) using video sequences of outdoor scenes where the weather introduces unpredictable variations in both lighting and background movement. The results are analyzed and reported, with the aim of identifying suitable directions for enhancing the robustness of motion detection techniques for outdoor video surveillance systems. Motion in indoor and other situations are considered and analyzed as well.

**Video Surveillance:**
Visual surveillance is an active research topic in computer vision that tries to detect, recognize and track objects over a sequence of images and it also makes an attempt to understand and describe object behavior by replacing the aging old traditional method of monitoring cameras by human operators. A computer vision system, can monitor both immediate unauthorized behavior and long term suspicious behavior, and hence alerts the human operator for deeper investigation of the event. The video surveillance system can be manual, semi-automatic, or fully-automatic depending on the human intervention. In manual video surveillance system, human operator responsible for monitoring does all the task while watching the visual informationcoming from the different cameras. Its an a tedious and arduous job of an operator to watch the multiple screen and at the same time to be vigilant from any unfortunate event. These systems are proving to be ineffective for busy large places as the number of cameras exceeds the capability of human experts. Such systems are in widespread across the world. The semi-automatic visual surveillance system takes the help of both human operator and computer vision. Tracking of object is being done by the computer vision algorithm and the job of classification, personal identification, and activity recognition is done by the human operator. These systems use lower level of video processing, but much of the task is done with the help of human operator intervention. In the fully-autonomous system there is no human intervention and the entire job is being done by the computer vision. These systems are intelligent enough to track, classify, and identify the object. In addition, it reports and detects the suspicious behavior and does the activity recognition of the object.

An appliance that enables embedded image capture capabilities that allows video images or extracted information to be compressed, stored or transmitted over communication networks or digital data link. Digital video surveillance systems are used for any type of monitoring. Broadly, video surveillance is the image sequences which are recorded to monitor the live activities of a particular scene. The importance of this digital evidence is given the first priority for any kind of occurrence. This digital information is recently become the field of interest to the researchers on the field of AI, Robotics, Forensic Science and other major fields of science.

**Surveillance applications are as follows:**
**1. Commercial and public security:** Monitoring busy large places like market, bus stand, railway station, airports, important government buildings, monuments, banks for crime prevention and detection. In all these busy places there is a large number of inflows and outflows of people in different multiple cameras take place. It is necessary for visual surveillance system to establish the correspondence of suspected person across multiple cameras and monitor its activity to prevent any mishap and also report to the nearby police station of any unclaimed/abandoned object in the place.

**2. Military security:** Surveillance in military headquarters, access control in some security sensitive places like military arms and ammunition store, patrolling of borders, important target detection in a war zone is done with surveillance systems.

**3. Traffic surveillance:** In urban environments monitoring congestion across the road, vehicle interaction, Detection of traffic rule violation [2] such as vehicle entry in no-entry zone, illegal U-turn can be done with visual surveillance systems. The camera records the entire event and then latter the culprit can be bookedon this evidence. The Video surveillance system can avert serious accidents, such that precious lives can be saved. Intelligent computer vision techniques can make the traffic congestion free, by finding out the congested road, and then diverting the traffic to other roads.

**4. Crowd flux statistics and congestion analysis:** Visual surveillance system can automatically compute the number of people entering or leaving andthen estimate congestion in busy public places like platforms in railway station, airports, and then provide congestion analysis to assist in the management of people.

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**5. Anomaly detection:** Video surveillance system can analyze the behavior of people and determine whether these behaviors are normal or abnormal. Suspicious behavior can be brought to the notice of the operator and can be further tracked such that any wrong doing can be avoided. visual surveillance system set in parking area could analyze abnormal behaviors indicative of theft.

## 2. LITERATURE SURVEY

**Elham Kermani and Davud Asemani[2014],**"A robust adaptive algorithm of moving object detection for video surveillance" presents a visual surveillance of both humans and vehicles, in which a video stream is processed to characterize the events of interest through the detection of moving objects in each frame. The majority of errors in higher-level tasks such as tracking are often due to false detection. It introduced a naval method for the detection of moving objects in surveillance applications which combines adaptive filtering technique with the Bayesian change detection algorithm. In proposed method, an adaptive structure firstly detects the edges of motion objects. Then, Bayesian algorithm corrects the shape of detected objects. The proposed method exhibits considerable robustness against noise, shadows, illumination changes, and repeated motions in the background compared to earlier works. In the proposed algorithm, no prior information about foreground and background is required and the motion detection is performed in an adaptive scheme. Besides, it is shown that the proposed algorithm is computationally efficient so that it can be easily implemented for online surveillance systems as well as similar applications.[11]

**Rupali S.Rakibe, Bharati D.Patil[2013],** "Background Subtraction Algorithm Based Human Motion Detection" presents a new algorithm for detecting moving objects from a static background scene to detect moving object based on background subtraction. Firstly set up a reliable background updating model based on statistical. After that, morphological filtering is initiated to remove the noise and solve the background interruption difficulty. At last, contour projection analysis is combined with the shape analysis to remove the effect of shadow; the moving human bodies are accurately and reliably detected.[39]

**Ching Yee Yong, Rubita Sudirman, Kim Mey Chew[2011],** "Motion Detection and Analysis with Four Different Detectors" presents a monitoring system is being enhanced utilizes motion detection technology with modified internationally recognized algorithms, implemented in C sharp and Matlab programming language. The result of this study is expected to be beneficial and able to assist users on effective motion detection and analysis. Four different motion detectors are being compared. The assessment includes three trials in three different speeds of motion and Morph filter has given a better and smooth detection. In conclusion, an effective motion assessment and monitoring system has been developed for the improvement of the motion detection ability.[6]

**Chandana S* [2011],**"Real Time Video Surveillance System Using Motion Detection" presents the area of video surveillance usage, it began with the simple video closed circuit television monitoring. In this paper they used the system for security systems such as borders or buffer zones is of utmost importance in particular with world wide increase of of military conflicts, illegal immigrants and terrorism over the past decade. The purpose of this is to design the a surveillance system which would detect motion in a live video feed and record the video deed only at the moment where the motion was detected also to track the moving object based on background subtraction using video surveillance. The moving object is identified using the image subtraction method.[5]

## 3. PROPOSED METHODOLOGY

Detection of changes made by the person or object in video is one of the most important and fundamental technology to develop the real world computer vision systems, such as video surveillance, security systems, video monitoring system etc. Detection of changes from a stationary camera is simpler because it involves fewer estimation procedures steps. Automatic detection of the movements of person or object in the video may facilitate this application in certain significant aspects. Those certain significant aspects are: First, Detecting unusual changes and abnormal behavior in a scene so that an alarm can be whistled in case of an unusual event. Second, controlling the camera automatically to present a neat and clean view of the object and organizing the

video data according to the movement activity of the patient. This approach helps in testing that whether a pixel or a region between two images is significantly different or not. In most comparison methods, images are

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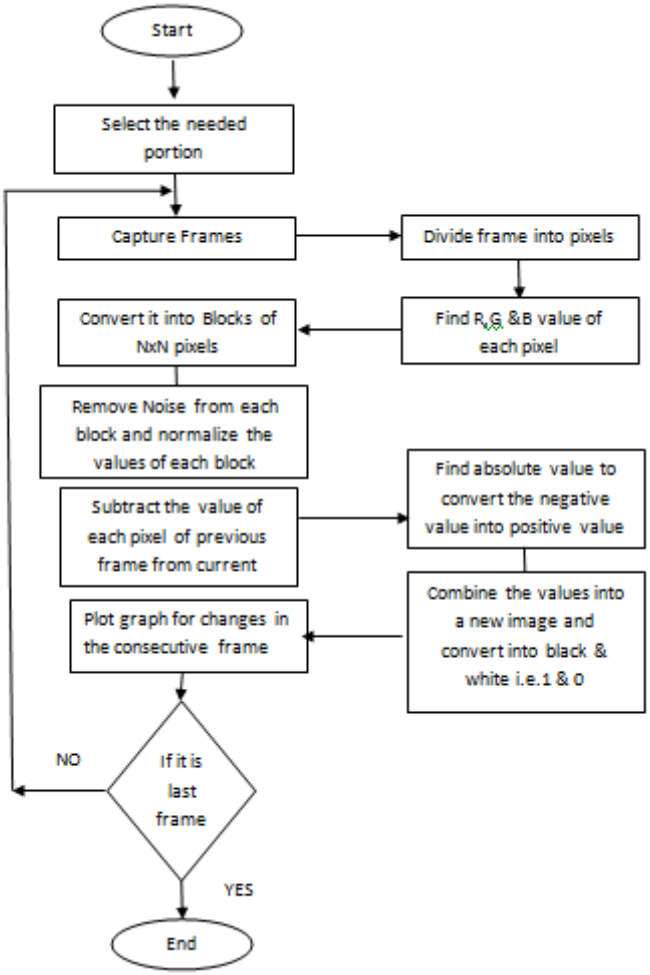
decomposed into blocks containing pixels which are then transformed into DCT coefficients. Whereas, we use image subtraction of consecutive frame to detect changes criteria. In this, a real time algorithm for detecting the changes subjects is proposed. The usual method for detecting changes objects is very simple that is to compare current image with respect to the previous image. However, there exist gradual illumination changes; sudden changes in illumination and other scene parameters alter the appearance of the current or the previous image. When the brightness difference between both that is in the current and in the previous image is small, it detect the difference. These algorithms such as color based subtraction technique and the technique based on optical flows have been proposed. This technique is very robust to extract the movement exactly. The commonly used method for changes subject detection is frame difference. Changes are detected from the difference of two frames. Movement monitoring system is a system that is used to detect movement of person or object. The algorithm is implemented in MATLAB and the results demonstrate that the accuracy is very promising. The algorithm can be used in video based applications such as automatic video surveillance, motion-based recognition, video indexing and security systems.In our research work, video is captured using a stationary camera. The selection of the model of a camera is an important aspect of any changes detection algorithm.




***Flow Chart of the Proposed System***

**Proposed algorithm**

**ALGORITHM**

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1. First we input the video of which you want to calculate the motion with the system.
2. Then the algorithm divides the each frame of the video in to pixel by pixel and finds the RGB value of each pixel.
3. Then convert the value of pixels into blocks of 8x8 pixels.
4. Remove the noise from each block and then Normalize the values of the every block.
5. After this subtract the normalized RGB value of each block of last frame from the current frame.
6. Then after subtraction of RGB values of two frame, it calculates the absolute value of each pixel.
7. By using absolute value, if the result is in the negative integer it converts into the positive integer.
8. Then convert the RGB value in to black & white which shows only two values of each block i.e. 0 and 1.
9. After this combine the binary value of each block to make a new image and open it into black & white area in which the changes show the white i.e. 1 & unnchanged portion shows the black i.e. 0.
10. Then calculate the percentage of changes of the selected portion , by using the changed area w.r.t whole selected area.
11. Store the current frame into previous frame.
12. At the end the graph will show the percentage of movement w.r.t time in seconds.
13. repeat steps from 3 to 13 until the there is last frame.

## 4. RESULTS AND DISCUSSION

We take low quality and high quality videos from two different cameras as input. we run both the low quality as well as high quality video on the proposed system for taking result as output.

***Table : statistics results***

| Parameter | Value |
|---|---|
| No. of Videos Tested | 20 |
| No. of Real World Situation Tested | 20 |
| Accuracy | 94% |
| Existing Accuracy | 89% |

The above table 5.1 shows the results statistics of the proposed system and that of existing system. In the table shown above it is shown that the proposed system is tested on 20 real world scenes and 20 real world videos. Accuracy of the proposed system and existing system is shown in the above table.

### 5.3 Graphical representation

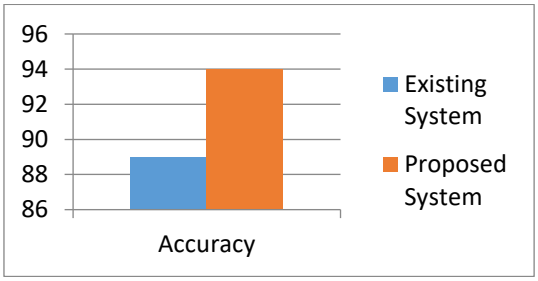


***Figure Comparison graph between existing and proposed system***

***Table 5.2 Comparison table of proposed with existing technique***

| Video Name | Existing Work (Percentage w.r.t Time) | | Proposed work (Percentage w.r.t Time) | |
|---|---|---|---|---|
| | *Low quality* | *High quqlity* | *Low quality* | *High quqlity* |
| Video1 | 77 | 66 | 82 | 71 |
| Video2 | 72 | 59 | 83 | 61 |
| Video3 | 69 | 54 | 72 | 63 |
| Video4 | 75 | 62 | 78 | 64 |

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| | | | | |
|---|---|---|---|---|
| Garden | 76 | 65 | 79 | 67 |
| Kid | 77 | 61 | 81 | 65 |
| Mall | 78 | 68 | 82 | 72 |
| Parking | 83 | 65 | 86 | 67 |
| Road | 76 | 68 | 80 | 72 |
| Room 1 | 83 | 71 | 86 | 75 |
| Room 2 | 70 | 69 | 75 | 74 |
| Shop | 79 | 71 | 84 | 75 |
| Stadium | 89 | 79 | 91 | 82 |

The above table 5.2 shows the comparison between existing and proposed system on the basis of motion detected from various videos. The above table represents the videos collected from various sources and their corresponding results.

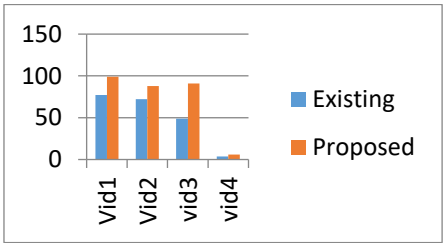


***Figure 5.2Comparison graph between existing and proposed system on low quality***

The above graph shows the comparison of the existing system and proposed system on low quality on the basis of videos collected from various sources. As it is shown that the proposed system can better detect the motion than that of existing system.

***Table Comparison of arithmetic operations for both proposed and existing system***

| | MOG | Existing system | Proposed Method |
|---|---|---|---|
| Arithmetic Operations | 3k + 6m | W+L+2 | W*L/8*8 |

The above table 5.3 represents the comparison of arithmetic operations between existing and proposed system. In the above table w,k represents the width of the frame and m,L represents height of the frame. From the above table it is shown that the proposed system requires less number of operations than that of existing systems.

## 5. CONCLUSION AND FUTURE SCOPE

**Conclusion**

In this study, a new method of monitoring and movement detection system is proposed. By using the image subtraction of the consecutive frames taken by the camera, We can select the needed part of the video instead of whole video and dete the various changes made by the any person or by object. The identification of the appropriate changes made by the person or by object is shown in the form of graphs. This research work is very helpful for video surveillance, security systems and for patient who were on bed for a long period and are unable to move. Because in these situations, only a minor movement made is detected that plays an important

role. Experiments have shown that this method produces accurate results with providing the movements in real time video and in video as input. sometimes in the low quality video it gives bad result but in high quality video

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it always gives better result as compared to the existing system. so we recommended the high quality camera for this proposed system.

**Future work**

A lot of movement detection systems are there in which we use stationary camera for monitoring and movement detection. This could be a talk for what possibilities there are for movement detection system in the future. How the systems of tomorrow will look like? ? It is likely that the user would want to be mobile. Whenever they want to monitor detection they could have a tablet PC with all the current charts and data for that video. The architecture for supporting this could be designed in different ways, but the main parts that have to be realized would be:

- An infrastructure for the monitoring devices to push their data into, for example a server with a database.
- It can also be identified in such a way that the monitoring device stores all the data and applications needing data connected directly to the monitoring device.

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