

# SURVEILLANCE OF OBJECT MOTION DETECTION AND CAUTION SYSTEM USING BLOCK MATCHING ALGORITHM

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**Abstract**— A monitoring and alerting application is introduced in this paper. IP Cameras are special cameras that stream the video feed into the internet as a video stream. This stream is captured and can be monitored for any unauthorized activities. Motion detection is done when movements are detected and the alarm goes ON if such movements are detected. We can start the alarm feature by entering a password and clicking on start button. Enabled for both local cameras as well as IP cameras. Remote monitoring from any part of the world using a very efficient motion detection algorithm for better security. The motion detection module consists of the motion detection algorithm which helps us to analyze the camera feed and to detect and signal any motion related triggers. It also comes with a motion sensitivity panel where you get to adjust the level of motion sensitivity that might be required. Block matching algorithm is used for motion detection and frame validation in the system.

**Keywords** - Motion detection, Block matching algorithm, frame validation.

## I. INTRODUCTION

A new era of computing technology evolving recently is the Internet of Things (IoT). Machine to machine, machine to infrastructure, machine to environment, the Internet of Everything, the Internet of Intelligent Things, intelligent systems call it what you want, but it's happening, and its potential is huge. We see the IoT as billions of smart, connected "things" that will encompass every aspect of our lives, and its foundation is the intelligence that embedded processing provides. The IoT is comprised of smart machines interacting and communicating with other machines, objects, environments and infrastructures. As a result, huge volumes of data are being generated, and that data is being processed into useful actions that can "command and control" things to make living much easier and safer and to reduce our impact on the environment. The creativity of this new era is boundless, with amazing potential to improve standards of living.

The Internet of Things (IoT) is the network of physical objects devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity that enable these objects to collect and exchange data. Environmental monitoring applications of the IoT typically use sensors to assist in environmental

protection by monitoring air or water quality, atmospheric or soil conditions, and can even include areas like monitoring the movements of wildlife and their habitats. The ability to network embedded devices with limited CPU, memory and power resources means that IoT finds applications in nearly every field. Such systems could be in charge of collecting information in settings ranging from natural ecosystems to buildings and factories, thereby finding applications in fields of environmental sensing and urban planning. Monitoring and controlling operations of urban and rural infrastructures like bridges, railway tracks, on- and offshore- wind-farms is a key application of the IoT.

The problem deals with the camera functionality with sensitive areas. In this problem the future is to be predicted earlier and footage should be stored in a data set or a storage device. The problem case requires 24/7 monitoring to detect any unusual activities occurring in the footage. The problem requires large data storage to save every feed from the camera as it is a 24/7 footage it needs data storage of at least in terabits size. The problem only provides moderate level of security; hence the system needs more secure operations and monitoring. In case of sensors, it is very expensive and implementation of sensors is limited as it operates only within small range which makes sensors unusable in large field of monitoring applications.

## II. RELATED WORK

[2] This paper proposes a system for the motion characteristics estimation of multiple objects with uncertain quantity. The system employs background subtraction method based on Gaussian Mixture Model to detect objects and tracks them through an improved algorithm combining Camshift with Kalman filtering. By analyzing the directions and trails of targets, the system can figure out their pixel distance and velocity. Experiment conducted realizes the proposed system, verifying its performance on motion characteristics estimation. For the detection of moving objects, we adopt background subtraction method based on Gaussian mixture model and introduce self-adaptive learning rate to timely update the background models. After extracting the targets in foreground, Process the binary image based on morphology operations and connected domain analysis for further improvement of accuracy in subsequent procedure.

[3] Moving item recommendation is now and again a champ among the most key and basic procedures in PC perspective programs. In this paper, a novel organization model is suggested to get rid of illustrating closer see things from files that may contain different sorts of disturbing impact, for instance, light changes, camera parameter varieties, bustles and component back-grounds, etc. For each appearance, an nearby do it again reaction guide is created using temporary double wavelet story distinguish in community areas, and by expelling the interaction among communities of the reaction summarize, reduced pixel emphasize is showed as close-by do it again plan. By then, a versatile probabilistic evaluation of pixel emphasize development changed from piece width evaluation is performed to determine the prospect of a pixel being organization. Test assessments on complicated moments of understanding files illustrate that the suggested system has stored deserving results.

[4] Motion detection is of paramount importance in video surveillance systems. In this paper, a novel algorithm is proposed to extract the exact boundaries of moving objects in video frames. Using the concepts of Cross-Correlation and Edge Detection, two well-known motion detection methods are combined to extract the moving regions more accurately. Also, these two methods are modified in terms of accuracy and processing time in order to make them suitable for algorithm. The experimental results prove that the proposed method significantly outperforms the other state-of-the-art schemes in terms of both objective and subjective performance. Another advantage of the suggested method over the others is its relatively low computational complexity and high implementation speed.

[5] A novel full-image guided filtering method is proposed. Different with many existing neighborhood filters, all input elements are employed during the proposed filtering approach.

In addition, a novel scheme called weight propagation is proposed to compute support weights. It fulfills the requirements of edge preserving and low complexity. It is applied to the cost-volume filtering in the local stereo matching framework. The algorithm utilizing the proposed filtering method is currently one of the best local algorithms on the Middlebury stereo tested in terms of both speed and accuracy. Filters with fixed-size convolution kernel, e.g., uniform (box filters) or Gaussian, can be used.

[6] New and more natural human-robot interfaces are of crucial interest to the evolution of robotics. This paper addresses continuous and real-time hand gesture spotting, i.e., gesture segmentation plus gesture recognition. Gesture patterns are recognized by using artificial neural networks (ANNs) specifically adapted to the process of controlling an industrial robot. Since in continuous gesture recognition the communicative gestures appear intermittently with the non-communicative, we are proposing a new architecture with

two ANNs in series to recognize both kinds of gesture. A data glove is used as interface technology. Experimental results demonstrated that the proposed solution presents high recognition rates (over 99% for a library of ten gestures and over 96% for a library of thirty gestures), low training and learning time and a good capacity to generalize from particular situations.

### III. EXISTING SYSTEM

The existing system provide variety of unwanted and heavy components which make the application very hard for usage, and it is also not fit for the actual usage purpose. They provide limitation for user connectivity through licensing of the developed software. This makes us unable to utilize the root purpose of the software at ease. Existing systems is difficult for the users to understand the design and working of the software and normally it is harder to use an inefficient methodology. Also local camera capability is limited and only remote camera monitoring facility is enabled. Gesture detection is done by sliding window algorithm. The feed from the camera is monitored 24/7 by a human. Different micro controllers are used to achieve motion detection. More number of sensors are used to detect the motion.

The existing systems have a very large stability issues which are very annoying, hence the existing system is unstable. The local camera is not supported, thus the existing system doesn't have locality support. The existing systems do not have a very good efficient motion detection due to which people don't want to use them in most cases which makes it inefficient. Future is to be predicted earlier and should be stored in a data set. It requires 24/7 monitoring to detect any unusual activities. It requires a large data storage to save every feed from the camera. It only provides moderate level of security. In case of sensors, it is very expensive and implementation of sensors is limited as it operates only within small range which makes sensors unusable in large field of monitoring applications.

### IV. PROPOSED SYSTEM

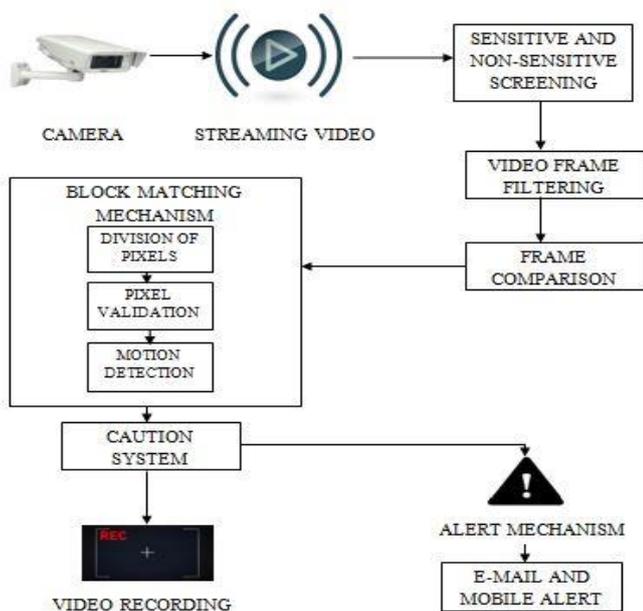
The proposed system is very efficient software that can be used to detect and monitor security with ease without the need of monitoring the system 24/7. The simple architecture of the proposed system makes it user friendly for the usage and implementation of the system. The proposed system does this by using a very efficient motion detection algorithm named block matching algorithm with a variable sensitivity screening namely sensitive and non-sensitive screening which makes it vital for the security purpose, there-by increasing the overall performance of the system. Both the sensitive and non-sensitive screenings are flexible and can be extended accordingly to the resolution and the pixel strength of the display and the camera used. The sensitive region can be set using a flexible box available over the current video stream.

The proposed system is very efficient software than the existing system as the proposed system doesn't use any

form of sensor to detect the motion occurred in the monitored region. The sensitive screening can be manually fitted by the user according to the region to be monitored where more level of security is needed. The area which doesn't come under the sensitive screening is automatically considered as the non-sensitive region. The caution system is triggered only when motion is detected in the sensitive region, any motion in the non sensitive region will not trigger the caution system. A motion detector is a device that detects moving objects, particularly people. Such a device is often integrated as a component of a system that automatically performs a task or alerts a user of motion in an area. They form a vital component of security, automated lighting control, home control, energy efficiency, and other useful systems. This proposed system can be used as an intruder alarm in home, offices, restricted areas in shopping malls, banks, sanctuaries etc.

The proposed system works efficiently in detecting the movements by using block matching algorithm with the sensitivity screening technique. The proposed system is a simple design, thus it has a better understandability. This system is very simple and efficient system which is very much robust under heavy usage. The proposed system does not crash even if under much load, thus the system is much stable than the existing system. Proposed system doesn't need a large storage space to save the video stream, as the video stream is not saved until motion is detected. The proposed system has reduced cost by eliminating the usage of sensors. This system does not need 24/7 monitoring as any changes occurring in the sensitive screening region triggers the caution system which in turn sends alert to the user. In the proposed system realtime motion detection is done using block matching algorithm and instant alerts are sent to the user.

**V.SYSTEM ARCHITECTURE**



Design Engineering deals with the various diagrams for the implementation of project. Design is the creation of a plan or convention for the construction of an object, system or measurable human interaction such as in architectural blueprints, engineering drawings, business processes, circuit diagrams, and sewing patterns. Design has different connotations in different fields. Software design is a process through which the requirements are translated into representation of the model.

The above figure represents the architecture of the proposed system. Initially a camera is to be installed facing the region that has to be monitored. Now the camera captures the video stream and displays it to the user through a monitor screen. After the successful installation of the camera the user is prompted by the system to set the sensitive region of area that has to be monitored for any motion in the region. The remaining region is automatically considered as non sensitive area.

Now, the process to detect any movement in the sensitive area begins. Every frame from the video is separated or filtered for comparison. The first frame of the video is set as the frame with which other frames are to be compared. Every frame from the video is now compared with the first frame of the video. During frame comparison the block matching algorithm is used to detect motion.

The block matching algorithm works by separating a frame into various numbers of blocks where each block is a collection of pixels. The collection of pixels of each block depends on the camera used. This is the first step of block matching algorithm which is said to be division of pixels. The second step is pixel validation in where each pixel in each block is validated for its maximum and minimum intensity. The value of maximum and minimum intensity of each pixel is stored. The maximum and minimum intensity of each pixel is determined by using the greyscale and colour imagery. Now, having the maximum and minimum intensity value of each pixel every block of the frame is compared with the first frame. If there is any change in the pixel intensity values above the ranged value then there is some motion in the sensitive region which in turn triggers the caution system.

Any motion detected in the sensitive region triggers the caution system and also the video stream is saved to the hard disk. Caution system is an alarm system which sends instant alerts to the user about the motion that has been detected in the sensitive region. The user receives two various alerts as shown. The user receives an email about the motion been detected and also a mobile alert is given to the user.

**1) Screening System**

Screening system module is where the user is prompted by the system to drag and fix the sensitive region that has to be monitored. In the proposed system there are two types of screening namely sensitive screening and non

sensitive screening. The area of interest that is to be monitored is said to be the sensitive region and the region other than sensitive region is said to be the non sensitive region. Screening system module works only after the successful installation of camera. The region other than the region which is fixed as sensitive screen is automatically set as the non sensitive screen. The screening system is dynamic (i.e) it is changeable using the drag function in the system.

## 2) Frame computation

The frame based computation in the system is done in this frame computation module. A video stream is a continuous flow of picture of every second. Each second of the video stream is a frame. The first step in frame computation is the separation of frames from the video stream. After separation the first frame is set as the frame with which other frames are compared. The second step of frame computation is the frame comparison. In here, every frame is compared with the first frame.

## 3) Pixel validation

Pixel validation module is the next step after frame computation. The working of block matching algorithm begins with division of pixels. The division of pixels is separating a frame into various numbers of blocks where each block is a collection of pixels. The second step is pixel validation in where each pixel in each block is validated for its maximum and minimum intensity. The value of maximum and minimum intensity of each pixel is stored. The maximum and minimum intensity of each pixel is determined by using the greyscale and colour imagery.

## 4) Motion detection

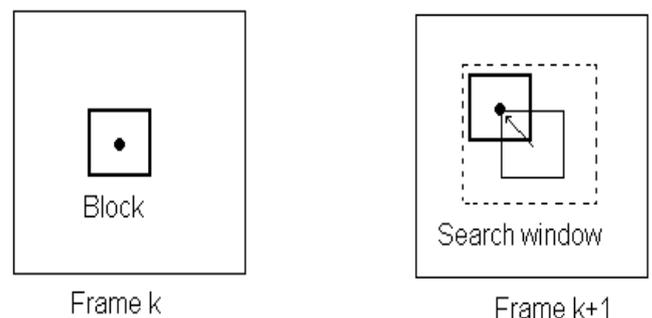
Motion detection is the module where the pixel intensity of every pixel in each block that was validated or determined is compared with the pixel intensity of the first frame blocks to detect any unusual changes in the pixel intensity value. The maximum and minimum intensity value of each pixel every block of the frame is compared with the first frame. If there is any change in the pixel intensity values above the ranged value then there is some motion in the sensitive region. Detection of motion also enables video recording and triggers the caution system.

## 5) Caution system

Caution system module covers the last part of the proposed system. This module works on alerting the user regarding the security threat. The caution system is enabled after detecting changes in the intensity value of the pixels in any block. The user is alerted in two ways. One is by sending an email to the registered mail id and another is by giving mobile alert to the user by alarm sound. The second method is implemented to make sure that the user is able to know about the security threat even when in move.

## ALGORITHM

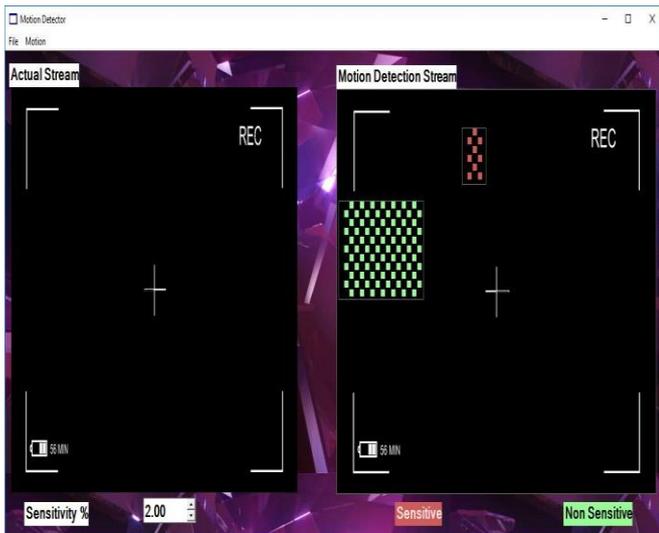
The algorithm which is used in the proposed system is the block matching algorithm. The block matching algorithm works by separating a frame into various numbers of blocks where each block is a collection of pixels. Before separating a frame into various numbers of blocks frame computation is done. That is frame filtering is carried out and the first frame is set as the frame with which the other frames has to be compared. The comparison of frames is done by comparing the pixel intensity of each block in every frame. The collection of pixels of each block depends on the camera used. The first step of block matching algorithm is the division of pixels. The second step is pixel validation in where each pixel in each block is validated for its maximum and minimum pixel intensity. The value of maximum and minimum intensity of each pixel is stored. The maximum and minimum intensity of each pixel is determined by using the greyscale and colour imagery.



Now, having the maximum and minimum intensity value of each pixel every block of the frame is compared with the first frame. If there is any change in the pixel intensity values above the ranged value then there is some motion in the sensitive region which in turn triggers the caution system and enables video recording.

## VI. EXPERIMENTAL RESULTS

C Sharp (C#) is a very powerful language that is a very common tool for building the windows tools. Her for our project we have selected this language since it servers to be the most effective placement since the most commonly used Operating systems now a days are windows and this runs in the .NET framework with very much stability. It is very simple and also doesn't need any additional frameworks to be installed before we work on it such as in Java which needs the Java JDK and JRE to be installed before we work on Java applications.



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## VII. CONCLUSION AND FUTURE ENHANCEMENT

The application of Remote camera monitoring is a new area of development, hence the novelty in the current system is the utilization of the local camera also along with the remote IP camera that makes the system ubiquitous. The application APIs have been designed in such a way that it can be used as interface between wide range of people and clients. The aspect can be used as a generic platform for many other security monitoring applications. After the testing work, advantages of the software were described and suggestions for further enhancement and improvement were discussed.

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