Video Surveillance for Human Motion Detection

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***Abstract*- The proposed system is a system which can be used for surveillance and monitoring applications. The development of an efficient real time video motion detection system is motivated by their potential for deployment in the areas where security is the main concern. The proposed system presents a platform for real time video motion detection and subsequent generation of an alarm condition as soon as the human motion is detected. The prototype consists of a mobile platform mounted with RF camera which provides continuous feedback of the environment. The received visuals recorded are then checked by user and then he can take the required control action, thus enabling the user to operate the system from a remote location. The system is also equipped with the ability to process and verify the image of the object and generate control signals which are automatically transmitted to the mobile platform to track the object.**

Keywords- RF Camera, Surveillance, Remote location

I. INTRODUCTION

Traditional video surveillance system needs huge amount of storage space. All the recorded videos were saved which requires excessive storage and thus it limits effectiveness of the system. In order to solve the problem, only the videos which contains necessary information i.e. the videos that contains motions are stored and all rest are ignored. When the lightning takes place it becomes difficult to distinguish the real motion from the lightning changes. So, an algorithm was developed which successfully distinguishes the motion from the lightning changes by taking the mean from the frame difference signal. Once the motion within the video is detected, the object is further classified whether it human or an object. This project uses robust algorithm which detects the motion by considering the lightning changes. As soon as the human motion is detected, the alarm will be triggered and the captured video will be send on registered email address. The proposed system is very efficient than the other traditional system. It uses the .NET framework and C# language for implementing the system. This project can be used in continuous monitoring applications i.e. jewellery stores, ATM, restricted areas, military purposes, etc.

II. LITERATURE REVIEW

Sreedevi M, Yaswanth Kumar Avulapati, Anjan Babu G, Sendhil Kumar R[1] implemented a system which uses DSP algorithm that detects motion and correlation method used to classify the object as human or nonhuman. The system is implemented in Matlab program.

Prithviraj Banerjee and Somnath Sengupta[2] proposed a system that employs a novel combination of an Adaptive Background Modeling Algorithm (related to the Gaussian Mixture Model) and a Human Detection for Surveillance System. The HDS system incorporates a Histogram of Oriented Gradients based human detector which is used for detecting humans in still images.

Antoine Manzanera, Julien C. Richefeu [3] proposed a new method based on a simple recursive non linear operator, the R–D filter along with a new spatiotemporal regularization strategy, using an original hybrid reconstruction method and spatiotemporal binary morphology, to exploit the spatial correlation and increase the confidence of the R–D detection.

Ying-Li Tian and Arun Hampapur[4] proposed a new real-time algorithm to detect salient motion in complex environments by combining temporal difference imaging and a temporal filtered optical flow.

Yong Shan and Runsheng Wang [5] developed two improved methods of shadow detection processing fused with updating the background sub-traction model, after the frame is changed to HSV color space from RGB color space so as to reduce the effect of illumination changes and shadows. They used the method of gradient field which is combined with region data to find the boundary of the object, instead of the level-set method.

Navneet Dalal and Bill Triggs[6] used the technique grids of Histograms of Oriented Gradient (HOG) descriptors outperform existing feature sets for human detection along with fine orientation binning, relatively coarse spatial binning, and high-quality local contrast normalization in overlapping descriptor blocks.

Mikhael Abou Nehme, Walid Khoury, Braheem Yameen, Mohamad Adnan Al-Alaoui[7] used an algorithm based on color characteristics and Kalman Filter for motion detection and tracking.The system was implemented using Mat Lab.

Qiang Zhu, Shai Avidan, Mei-Chen Yeh, and Kwang-Ting Cheng [8] used the technique of integrating the cascade of rejectors approach with the Histograms of Oriented Gradients (HoG) features to achieve an accurate human detection system.

Guo Jing, Deepu Rajan and Chng Eng Siong[9]used the Otsu's thresholding method dynamic is used to binarize the difference image between a background image and a new coming image. The threshold for the R,G and B color channels are found and used to get the final foreground mask for motion detection.

III. PROBLEM STATEMENT

Several problems exist in human motion analysis and this includes:
Unable to provide an optimal method of dimensionality reduction to achieve higher recognition rate.10
Human motion tracking cannot be done (from the training set) by combining the Eigen faces alone.
The weighting factors need to be more adaptive to achieve better results.
Less scalability exists for detecting human motion.
Imageblock matching, gradient constraints, phase conservation or energy models are bottlenecks.

IV. EXISTING SYSTEMS AND THEIR GAPS

Kalman Filter:
The two major limitations of Kalman filter are:
It assumes that both the system and observation models equation are linear, which is not true in many real life situations.

It assumes that the state belief is Gaussian distributed.

Histogram of Oriented Gradient:
The disadvantage is that the final descriptor vector grows larger, thus taking more time to extract and to train using a given classifier.

Temporal difference imaging:
It cannot detect the object that moves in different direction such as moving in zigzag cannot be detected because it is assumed that the object with in motion moves in a consistent direction. Second, if the object stops for a moment, it will be lost. But it can be detected when it starts to move again.

V. COMPARISION WITH PROPOSED SYSTEM

Unlike the traditional video surveillance systems which cannot trigger an alarm. The proposed system triggers an alarm and sends an SMS indicating that motion is detected along the snap of the area where the motion occurred. The system proposed by Navneet Dalal, Bill Triggs[6] stores all the videos which increases the need of storage space. The proposed system stores only relevant videos thus making it easy for the humans to make review.

VI. SYSTEM OVERVIEW

The proposed system has four main components:

- Image Aquisition
- Image Segmentation And Image Subtraction
- Recognition Engine
- Action

6.1 Image Aquisition: This is the most initial step for the motion detection algorithm. This block accepts the image from the camera or the recorded sequence in ".avi" format.

6.2 Image Segmentation and Image Subtraction:
6.2.1 Image Subtraction: In this part, the two subsequent images are compared and processed using absolute arithmetic subtraction. This block it separates the image into three planes. It then performs the arithmetic operations on each plane. The results are then combined back to form the color image. The result is in inverse color format because the subtraction on pixel values is performed.

6.2.2 Image Processing: In this step, the image processing operations are performed on the result of the previous step. There are two outputs from this block. The first is the result obtained from the threshold function. The result of this is further used for the recognition purposes since it filters the human body shape better than the other output. The other output from this block is the eroded and dilated image. This function removes the small pieces of noise that may be present because of the camera signal noise or small pixel changes.

6.2.3 Contour Finding: This operation is performed on the eroded and dilated image obtained from the above step. The contours are displayed with different colors for the contours which are different from each other. The contours having same color are considered to be connected.

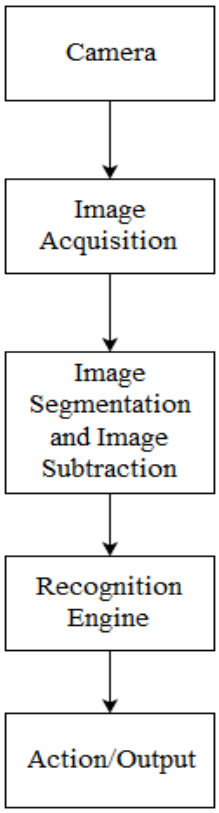

Fig. 1 System Overview

6.2.4 Bounding Rectangle Calculations: In this step the operations are performed to remove the overlaying boxes or rectangles when drawn to the source image. The rectangles and boxes which are near and almost crosses one-another edges are joined together to form the large rectangle.

6.2.5 Binary Image Processing: In this step, the processing is performed on the threshold image. The image is further enhanced to fill the empty spaces inside the binary region to

detect the object in motion. An algorithm it scans through the vertical line and filling up each vertical line's first and last pixels'. Also on the horizontal lines the same task is performed. After we obtain the resultant image from these algorithm, we use the AND operator to combine both the result to form a better representation of moving object shape.

6.2.6 Area Mapping: After the bounding rectangles are identified, the position is then mapped to the source image and the rectangle being drawn there. Mapping is done for the area of the bounding boxes drawn in the source and also the corresponding area in the binary processed image. The area from this processed binary images are the ones to be used for the recognition engines. This project does not cover the recognition engine and the output component. The recognition engine is implemented from the work of the partner in this project.

6.3 Recognition Engine: In this block, .NET framework, which contains different classes for motion detection is used to extract the object under motion clearly. Once the object is extracted it is classified whether it is an object or human.

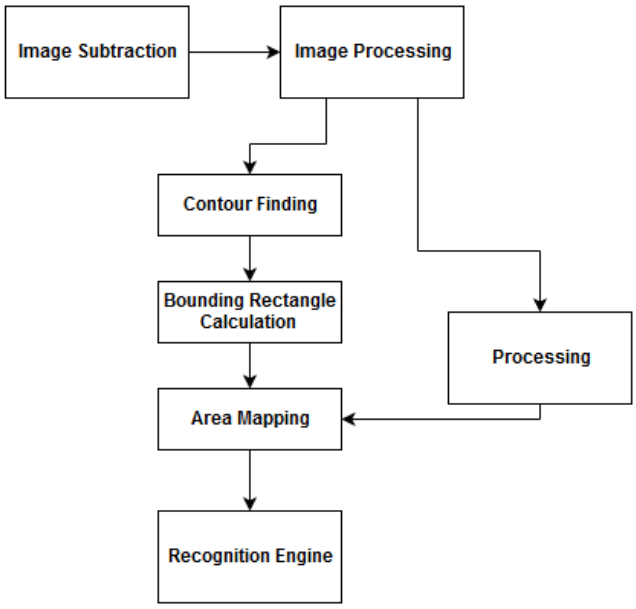

Fig. 2 Image Segmentation and Image Subtraction

6.4 Action: In this block, if the motion is done by the human then the alarm is triggered and the mail is send on the registered email address which contains the image of the area where the motion is detected.

VI. RESULT

If in front of the camera the human is present or a clip is given that contains human then the system gives as output Object is human.

Input1:

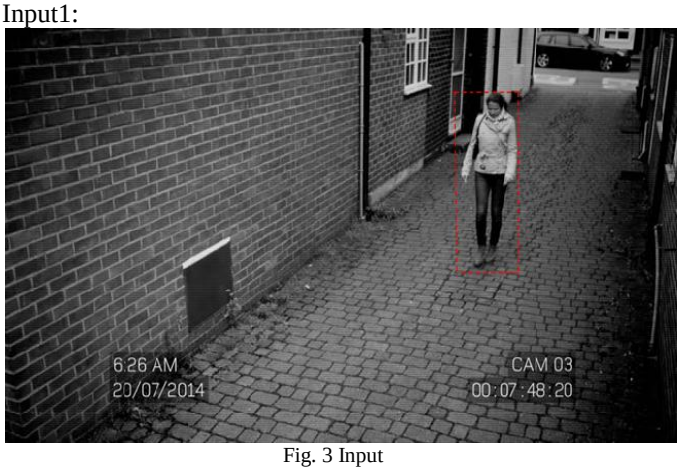

Fig. 3 Input

Output1:

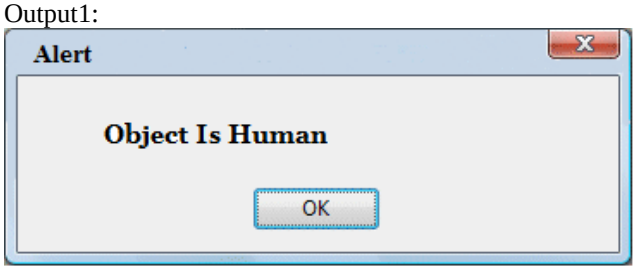

Fig. 4 Output (Human/Object)

If in front of the camera the object is present or a clip is given that contains non-human then the system gives as output Object is non-human

Input2:

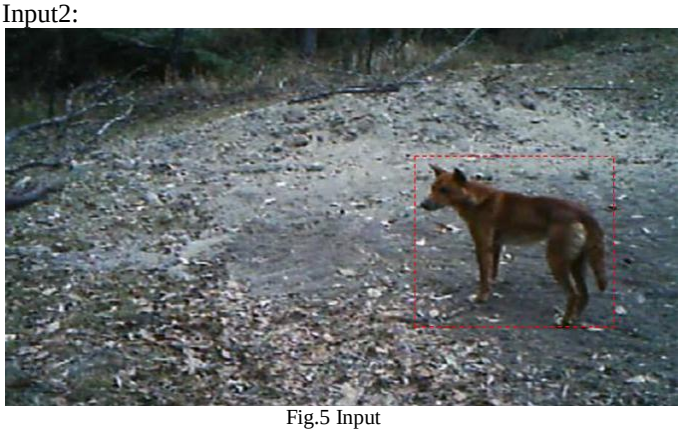

Fig.5 Input

Output2:

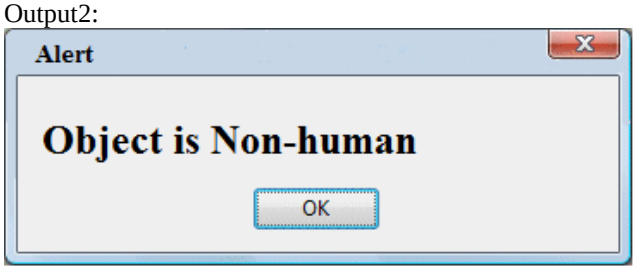

Fig. 6 Output (Human/Object)

VII. FUTURE SCOPE

In the proposed system, exact classification of non-human i.e. whether it is cat, dog, car, bike, etc. can be recognized. System can be further developed to recognize the human activities, as well as speed with which the human is moving and the distance can found out i.e. how far is he form the camera. System can be also developed to recognize the facial expression of the human and also the face recognition can be done.

VIII. CONCLUSION

Detecting human motion accurately in a video is one of the important topic of research due to its application in security purposes. It is quite challenging to process the image obtained from a surveillance video due to its low Resolution and night vision. This system allows user to intrigue the mobile platform from a remote location. The detection process in our system occurs in four steps: Image Acquisition Image Segmentation,Image Subtraction,Recognition Engine and Action The system provides feedback to the end user via a mail on the registered email address which contains the visuals of the captured human motion thus can be useful for spying purposes.

IX. REFERENCES

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