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A Home Security System Using Background Subtraction

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Abstract: This paper presents a technique for human object detection and recognition that uses basic model for back ground subtraction. Background subtraction approach is used to detect the moving object from background. Our proposed technique takes the first frame from a live video (from web cam/CCTV) when it is switched on and compares it with the next frames of the video sequence in an interval. Thus when it detects an object system analyzes it. If it is a human being alarm rings. The system used in the study ranges from varying levels of accuracy and computational complexity. In future enhancement of this work is remotely we are checking and providing security to our system.

Keyword: Background subtraction, Real-time systems, Video surveillance, Segmentation, Human recognition, Alarm system.

I. INTRODUCTION

Background subtraction is one of the key techniques for automatic video analysis especially in the domain of video surveillance. The basic idea in the approach is detecting the moving objects from the difference between the current frame and the reference frame, which is called "Background Model". The background image must be good so that it adapts to the varying luminance conditions and geometry settings. Poor background image may result in poor background subtraction results, because it is to be subtracted from the current image to obtain the final result. Processing a video stream to segment foreground objects from the background is a critical first steps in many computer vision applications. The popularity of background subtraction algorithm largely comes from its computational efficiency, which allows applications such as human computer interaction, video surveillance to meet their real time goals many different methods have been proposed over the recent years. Some of them are currently used in CCTV detection application by the defense personals. This different technique varies in computational speed, memory requirements and accuracy basically.

II. DIFFERENT BACKGROUND SUBTRACTION METHODS

Background Subtraction is a process of extracting a foreground objects from a maintained background model. It is an approach used to detect the moving object from the background. Any entity i.e. detected by producing difference of every frame of sequence to reference frame. It is used a moving object from a background and uses a reference background image for comparison. A reliable and robust background subtraction should handle sudden or gradual illumination changes. A simple approach to apply background subtraction is by estimating the background for a time t and then subtracting the estimated background from the input frame. By applying a threshold Th, to the absolute difference we get the foreground mask. The places where there are differences are detected as moving objects. Three methods are studied as under:

A. BASIC METHOD [2]:

The basic method [2] of background subtraction uses a reference frame B(x,y) and subtracts it from the current frame I(x,y)] to give the output. The result is then compared with a threshold value. It done as follows:

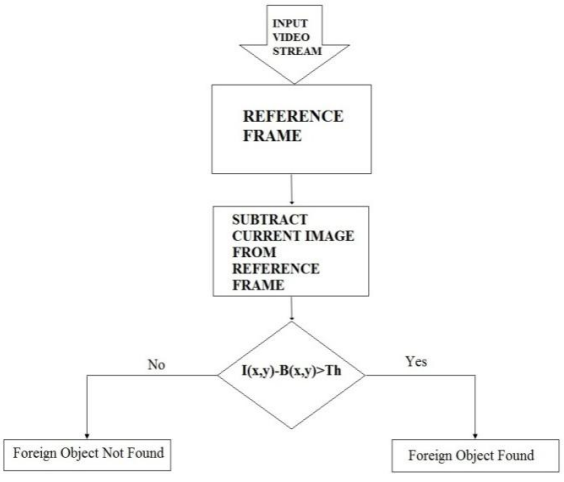
Frame difference:

$| I(x, y) – B(x, y) | > Th$

I(x, y) = current incoming video frame

B(x, y) = reference image

It is very sensitive to the threshold Th.



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B. LOCAL-PATCH GAUSSIAN MIXTURE METHOD:
Gaussian mixture method is a complex method. Shih-Chieh Wang, Te-Feng Su and Shang-Hong Lai proposed Local-Patch Gaussian Mixture Model to detecting moving objects from dynamic background. As Massimo Piccardi [1] reviewed different techniques out of which Gaussian mixture model proved very good accuracy model. So they build background model by using several frames in beginning of input video as training data i.e. {X_1, X2 …XN}, which is modeled by mixture of K Gaussian distribution at time t as follows:
$P(X_t) = \sum K_{i=1} w_{i,t} \cdot \eta(X_t, \mu_{i,t}, \sum_{i,t})$
Where η is probability density function.

Local Patch size for each pixel is defined as d×d. Let intensity value of observed pixel is $f_t(x,y)$, for each observed pixel window is set around the pixel as center .The original Xt in GMM model is extended to a d2 – dimensional vector for each observed pixel as follow:
$X_t(x,y)=[f_t(x-d',y-d')..f(x,y)\ldots f(x+d',y+d')]^T$
Where $d'=(d-1)/2$ D(Xt(x,y),μt(x,y)) is mean difference between $X_t(x,y)$ and $\mu_t(x,y)$.If the observed pixel is said to be background if it satisfies equation as follows: $D(X_t(x,y),\mu_t(x,y)) \leq 2.5 \sum_{-d' \leq i,j} \sigma_t(x+i,y+j)$.
Otherwise pixel is classified as foreground.

C. EIGEN BACKGROUND MODEL
This is another model to implement background subtraction. It works well and faster than Gaussian mixture model. It is processed as follows –

1) The n frames are re-arranged as columns of matrix, A
2) The covariance matrix, $C = AA^T$, is computed
3) From C, the diagonal matrix of its eigenvalues, L, and the eigenvector matrix, Φ, are computed
4) Only the first M eigenvectors (eigenbackgrounds) are retained
5) Once a new image, I, is available, it is first projected in the M eigenvectors sub-space and then reconstructed as 'I'
6) The difference I– I' is computed: since the sub-space well represents only the static parts of the scene, the outcome of this difference are the foreground objects
From the survey we come to the conclusion that though it is a simple one, Basic model will lead us to our goal.

III. SEGMENTATION

After getting the foreground mask we use edge and the Sobel operator to calculate the threshold value. We then tune the threshold value and use edge again to obtain a binary mask that contains the segmented part then boundaries are smoothen to detect the border. Segmentation partitions an image into distinct regions containing each pixel with similar attributes. For image analysis and interpretation, the regions should strongly relate to depicted objects or features of interest. Segmentation is the first step from low-level image processing transforming a gray scale or color image into one or more other images to high-level image description in terms of features, objects, and scenes. The success of image analysis depends on reliability of segmentation, but an accurate partitioning of an image is generally a very challenging problem.
The segmentation process in our project is as follows:

1) Detect entire foreign object
2) Dilate the image
3) Fill interior gap
4) Remove connected objects on the border
5) Smoothen the object

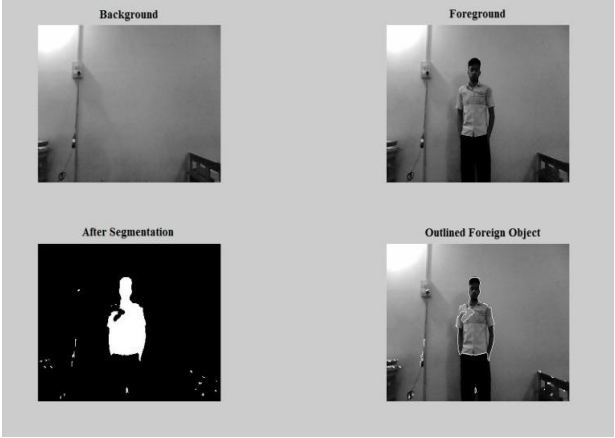
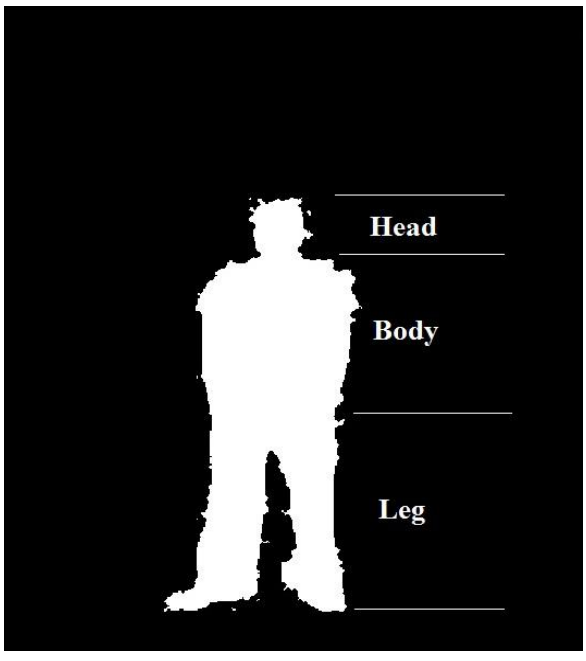


Fig: Output of segmentation

IV. RECOGNITION

The output of segmentation is used to recognize the object. Since it is a binary image there will only two value in the output. Zero for black and one for white. The idea is that line scan is performed on the output of segmentation to find the size of the object. Thus the height and width of the object is calculated. Now the measurement is divided into three portions; head, body and leg according to the body ratio of a human. Then it is compared with the previously store standard data set. If the ratio matches the algorithm will proceed to sms alert.



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V. SMS ALERT

When it is confirmed that the foreign object is Human after the recognition is done, and then we have to alert the owner that a threat is detected. We can alert by sending SMS to the owner's phone number that a human is entered the room in which we installed the system for security purpose. Sending an SMS through a modem is used in this case. A SIM will be inserted in the modem by which SMS will be sent. AT command are used for sending SMS. AT command means Attention, used to start a command line by this AT command.

VI. PROPOSED MODEL

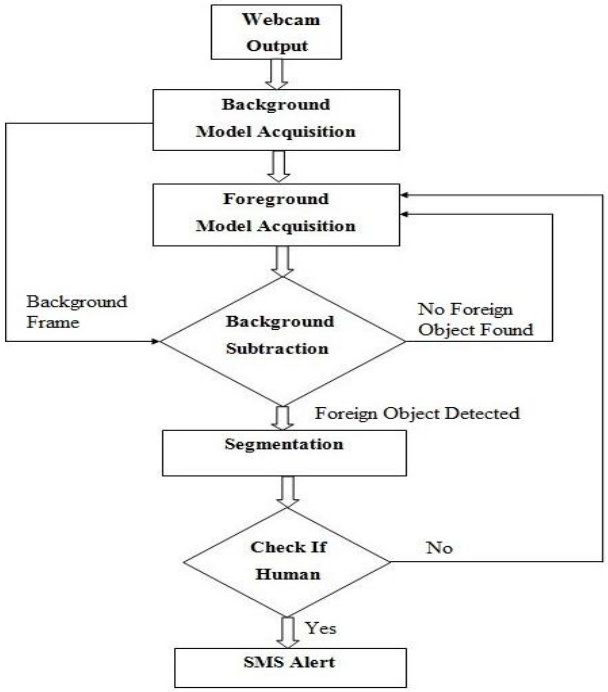

Fig: Flow Chart

At first output of web cam is acquired. We take frames from the live video sequence which is obtained through web cam. The initial frame of the video is taken as the background image. Then next frames are observed. A frame is taken after some interval of time which is denoted as the Foreground model or foreground image. Then, for these two images, Background subtraction is done. The difference of these two images is taken. If foreign object is not found another frame is feed for background subtraction after 10 sec. After detecting foreign object, Segmentation is done. Segmentation process is divided into five more parts, detection of entire foreign object, dilation of image, filling the interior gap, removal of connected objects on the border, smoothing the image. We get an outlined image. After the completion of Segmentation part the program checks if it is human or not. A set of data is stored and the outlined image is compared with it. If it is matched, it is human and soon the alarm system is activated.

VII. CONCLUSION

In this paper we have discussed the background subtraction approaches, regimentation and recognition of human object. The system works well for static camera. But it finds some difficulty in outdoor and robust environment.

REFERENCES

[1]. Massimo Piccardi" Background subtraction Techniques: a review"2004 IEEE International Conference on Systems, Man and Cybernetics
[2]. Harti,Tejinder Thind: "Background Subtraction Technique-Review" By , 2013 IJITEE
[3]. "Human Motion Detection and Video Surveillance Using MATLAB" By Sapana K. Mishra and Kanchan .S Bhagat, 2014 IJSER
[4]. www.mathworks.com