

Where $\mu R(i)$, $\mu G(i)$ and $\mu B(i)$ are the arithmetic means of the i th pixel's red, green and blue values computed over N background frames. So far, we have defined E_i and s_i .

b) Background Update

For accurately extracting the moving object the background needs to be updated in real time and the background model can better adapt to light changes. In the proposed method, the update algorithm is as follows: In the moving object detection, the pixels judged as belonging to the moving object maintain the original background gray values, not be updated. We update the background model according to following rule for the pixels which are judged to be the background [3]

$$B_{k+1}(x,y) = \beta B_k(x,y) + (1-\beta) F_k(x,y) \text{ -----4}$$

Where $B(x,y)$ is background image, $F_k(x,y)$ is current image and $F_3 E(0,1)$ is update coefficient, in this paper $f_3 = 0.004$. $F_k(x,y)$ is the pixel gray value in the current frame. $B_k(x,y)$ and $B_{k+1}(x,y)$ are respectively the Background value of the current frame and the next frame. As the camera is fixed, the background model can remain relatively stable at one position for very long period of time. Using this method we can avoid the unexpected phenomenon of the Background, such as the sudden appearance of something in the background which is not included in the original background. Moreover, the impact brought by light, weather and other changes in the external environment can be effectively adapted by the updating of pixel gray value of the background.

c) Moving Object Extraction

When the background image $B(x, y)$ is obtained, subtract the background Image $B(x,y)$ from the current frame $F_k(x, y)$. Set threshold as T . If the pixel difference is greater than threshold T , then determines that the pixels appear in the moving object, otherwise, as the background pixels. The moving object can be detected after threshold operation [3]. Its expression is as follows:

$$D_k(x, y) = \{1 \mid |F_k(x,y) - B_{k-1}(x,y)| > T \text{ -----(5)} \\ = \{0 \text{ others Where, } D_k(x, y)$$

is the binary image of differential results. T is gray-scale threshold. Its size determines the accuracy of object identification. As in the algorithm T is a fixed value, only for an ideal situation, is not suitable for complex environment with lighting changes. Therefore, this paper proposes the dynamic threshold method, we dynamically changes the threshold value according to the lighting changes of the two images obtained. On this basis, add a dynamic threshold T to the above algorithm.

d) Extraction of Moving Human Body

Some accurate edge regions are got after doing the median filtering and morphological operations. But the moving human body regions could not be determined. By observation, we can find out that when moving object appears, shadow will appear in some regions of the scene. The presence of shadow it is difficult to extract the moving object accurately. By analyzing the characteristics of motion detection, we combine the projection operator with the previous methods [6]. Based on the results of the methods above, adopting the method of combining vertical with horizontal projection to detect the height of the motion region. This can remove the impact of the shadow to a

certain degree. Then we analyze the vertical projection value and set the threshold value (determined by experience) to remove the pseudo-local maximum value and the pseudo-local minimum value of the vertical projection [7] to determine the number and width of the body in the motion region, we will get the moving human body with precise edge. We are assuming that people in the scene are all in upright-walking state.

C) Detection of Moving Objects in the Video

Motion detection has been done using spatio-temporal differencing. For motion detection based on the spatio-temporal filter, the motion is characterized via the entire three-dimensional (3D) spatio-temporal data volume spanned by the moving person in the image sequence. Its advantages are low computational complexity and a simple implementation process. Here, Motion detection is carried out by the background elimination algorithm as follows.

D) Background Elimination

The background subtraction system is used to provide foreground image through the threshold of difference image between the current image and reference image. As the reference image is the previous frame, this method is called temporal differencing. The temporal differencing is very adaptive to dynamic environment. Background elimination was carried out using mean squared error concept.

2. Proposed Methodology

A) Algorithm for background Elimination

1. Begin
2. Read video using `mmreader` command in MATLAB.
3. Extract number of frames, height and width of frames.
4. Pre-allocate output video structure with all its elements assigned value 0.
5. Divide each frame into blocks of size 16x16 each.
6. Compare blocks of first frame with the corresponding blocks of each frame using meansquared error(MSE) concept.
7. If MSE is less than 5 percent the blocks are considered to be matched.
8. If more than half the corresponding blocks match, the blocks are considered to be a part of background and are made white in the output video structure.
9. If none or less than half the number of corresponding blocks does not match, they are considered to be moving object and original video values are assigned to those blocks in the output video structure.
10. The output video now contains only the moving object and background is eliminated.
11. End

B) Human Detection from background eliminated video

A shape-based approach for classification of objects is used following background subtraction based on frame differencing. The goal is to detect the humans for threat assessment. The target intruder is classified as human or animal or vehicle based on the height to width ratio (H/W) of the moving object detected during background subtraction.

a) Algorithm for human detection

1. Begin
2. Read the original and background eliminated videos using *mmreader* function in MATLAB.
3. Extract the number of frames and frame size.
4. Pre-allocate output video structure assigning zeros to all its elements.
5. Make the pixels corresponding to moving object white and the rest black.
6. For each frame number of blocks containing moving object are checked to satisfy H/W ratio depending on area covered by camera.
7. Draw top, bottom, left and right lines in red color to highlight the detected human.
8. End

3. Applications

For an intelligent video surveillance system, the detection of a human being is important for abnormal event detection, human gait characterization, people counting, person identification and tracking, pedestrian detection, gender classification, fall detection of elderly people, etc.

a) Abnormal event detection:

The most obvious application of detecting humans in surveillance video is to early detect an event that is not normal. Abnormal events can be classified as single-person loitering, multiple-person interactions (e.g. fighting and personal attacks), person-vehicle interactions (e.g. vehicle vandalism), and person-facility/location interactions (e.g. object left behind and trespassing).

b) Human gait characterization:

Detection of humans in walking can be carried out by extracting double helical signatures (DHS) from surveillance video sequences. DHS is robust to size, viewing angles, camera motion and severe occlusion for simultaneous segmentation of humans in periodic motion and labeling of body parts in cluttered scenes.

c) Person detection in dense crowds and people counting:

Detecting and counting persons in a dense crowd is challenging due to occlusions. Multiple height homographies for head top detection can be used to overcome this problem. Advantage of the stationary cameras to perform background subtraction and jointly learn the appearance and the foreground shape of people in videos can be taken.

d) Person tracking and identification:

A person in a visual surveillance system can be identified using face recognition and gait recognition techniques. The detection and tracking of multiple people in cluttered scenes at public places is difficult due to a partial or full occlusion problem for either a short or long period of time.

e) Pedestrian detection:

Pedestrian detection is another important application of human detection. A pedestrian detection system can be described by integrating image intensity information with motion information. The detector can be built over two consecutive frames of a video sequence and can be based on motion direction filters, motion shear filters, motion magnitude filters and appearance filters.

f) Fall detection for elderly people:

Automatic detection of a fall for elderly people is one of the major applications of human detection in surveillance

videos. Projection histograms of segmented human body silhouette can be used as the main feature for vector posture classification and the speed of fall can be used to differentiate real fall incident and an event where a person is simply lying without falling.

g) Consumer Surveillance System:

Automatic surveillance requires a sufficiently high accuracy and the computation complexity should enable a real-time performance. For such a system, we need to analyze not only the motion of people, but also the posture of the person, as the postures of the persons can provide important clues for the understanding of their activities. Hence, accurate detection and recognition of various human postures contribute to the scene understanding.

4. Conclusions and Results

A video monitoring detecting system was thus developed successfully in this project. This system mainly provides an efficient method for surveillance purposes and is aimed to be highly beneficial for any person or organization. Thus motion based change detection in .avi video format was completed and successfully implemented. I propose an instance based method for human detection in videos, which is motivated by a range of applications. An implementation and system design of a prototype system developed for testing purposes is reviewed in this report as well. In this paper, a human body detection algorithm based on the combination of temporal information and shape information is designed. Firstly, moving objects are detected using the proposed background elimination technique. Secondly, shape information is used to distinguish human body and other moving object and the outside rectangle of moving object is computed using the max width and height value of the moving regions. Furthermore, occlusion during a short time is handled by detecting the shape of moving object in continues frames. The evaluation cases shows the accurate detection of moving object and the detection result do not effect by the body pose. Also, the shadow of moving object has been eliminated in detection step, thus human can be detected.

$$\text{Overall efficiency} = (\text{Successful cases} / \text{Total no. of cases}) \times 100$$

$$\text{Overall efficiency (\%)} = 7/9 \times 100$$

$$\text{Overall efficiency (\%)} = 77.78\%$$

Overall Efficiency of the project is about 77.78%, i.e., most of cases gave the successful result by the proposed detection algorithm. The algorithm is robust to noise and can detect the human bodies under complex circumstance.

Table 1: Analysis of different cases

Case No.	Case	Fail/ Success
1	Single person case	Successful
2	Body pose change (standing to sitting)	Successful
3	Two person crossing case	Successful
4	Front crossing case	Successful
5	Half body detection case	Successful
6	Multiple persons case	Successful
7	Shadow Eliminations a) Horizontal Shadow b) Vertical Shadow	Successful Failed
8	Moving camera	Failed



Figure 1: Original Video



Figure 2: Back ground elimination

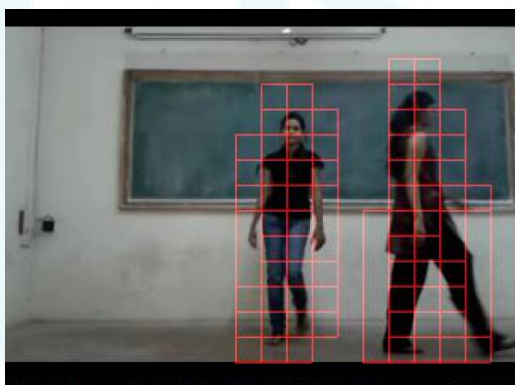


Figure 3: Human Detected

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