Moving body/object detection and tracking

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ABSTRACT

This paper describes a method of exactly tracking a moving body in video capture from camera. It also overcome problem of blurring and noise. Initially moving body is exactly detected by its motion and then track it for exactly getting moving body. Method used is background subtraction and for object tracking we used colour feature specification for differentiate between objects. This method is effective for both indoor and outdoor videos.

Keywords: moving body tracking, moving body detection, background subtraction, blurring

1. INTRODUCTION

There are several methods to find moving body such as optical flow technique in which its model is difficult to establish and it has poor performance against noise parameter. Second method is frame subtraction methods which is unable to drawing out or extract moving parts in video. Its output is not precise. In this process two continuous frames are taken and subtracted from each other that difference between frames can determine moving object but it gives limitations such as complete and accurate detection of body cannot be determine. In this paper we combine both techniques i.e. background subtraction technique and tracking (apply tag for moving body)

2. RELATED WORK

To find and track moving body are important parameters of video stream. First of all we have to develop a background model without any moving object then this model will be subtracted from present frame which results moving body detection. Background frame should be taken in real time to accurate extract moving body. After detection of moving body we can track it by providing tag. in this method we can determine parameters like accuracy, MSE, PSNR, Entropy etc For exact tracking the body suitable technique of body detection should be used because motion of moving body can be affected by many practical parameters such as change of light, shadow etc. our method is suitable for both indoor and outdoor environment video.

3. METHODOLOGY

Developed algorithm consist three important steps. first of all we have to apply input video stream to the system, then moving body can be detected by background subtraction method and that object is then track exactly.

![Block diagram](image)

Figure.1 block diagram

To avoid problem like shadow, blurring etc which losses the data, hence we have used mean filter to overcome these problems.

1) Motion detection by the method of background subtraction

Basic concept behind this method is that a known background model is to be form without moving object, after that the background having moving body i.e. current frame will be subtracted from each other. In this war resultant difference can be detect moving body and by the use of mean filter it can remove shadow and blurring effect.

\[ B(a, b) = \beta B_k + 1(a, b) - (1-\beta) F(a, b) > T \]  

(i)

Where \( \beta = 0.004 \).

\( F(a, b) \) = gray value of pixel in present frame. \( \beta B_k + 1 \) = background value of present frame and next frame. \( T \) is threshold for removing shadow or noise depending on value applied.
4. Flow Chart

Background subtraction is used in applications like traffic monitoring systems, people detection, and tracking, etc. The first n video frames are used to train the background model to achieve a model that represents the variation in the background during this period. The frames (from n + 1 and onwards) are each processed by the background subtraction module to produce a mask identified by comparing the incoming frame with the background model. Information from frames n + 1 and onwards is used to update the background model.

a) Tracking of moving body

Once a moving body is detected, tracking of that body is performed. For that feature or color parameter of body can be extracted and clustered to clusters. Each cluster having its own value. Color information can be matched between the present frame and the previous frame, i.e., we have to segment motion blocks in such areas as hands, feet, head, etc. These values of clusters moving body can be stored for further comparison. In short, color information of the present frame and the previous frame is compared, and according to that, the moving body can be tracked. To remove the shadow and blurring, we use the filtering operation. After filtering operation, some exact edges will be obtained but the region connected to the moving body cannot get, i.e., shadow will present their which may affect the accuracy of extraction. By adopting vertical and horizontal projection, we can detect the height of motion part; this can remove the effect of shadow. A tag is assigned to the moving body after finishing cluster comparison.

5. Experiment and Results

Here we use a camera for outdoor environment video images and we calculate the number of parameters such as accuracy, MSE, PSNR, Entropy, etc.

1. Input video
2. Moving body Detection

![Image3](image3.png)

**Image3.** Moving body detection.

3. Tracking the body

![Image3](image3.png)

**Image3.** Tracking the body.

4. Parameters Evaluation

**a. Velocity:** The velocity of object is depend on distance travelled by body and frame rate

\[
\text{Velocity} = \frac{\text{Distance travelled by body}}{\text{Frame rate}}
\]

**b. Sensitivity:** \( Tp/(Tp + Fn) \)

Where, \( Tp = \text{True Positive} \): Object pixels correctly classified as object.

**c. Correlation Coefficient:** It is used to find the similarity between two different images with their intensities. It will be described by,

\[
\text{Cor coef} = \frac{\sum (\sum (u1 \times u2))}{\sqrt{\sum (\sum (u1 \times u1)) \times \sum (\sum (u2 \times u2))}}
\]

Where, \( u1 = F1 - \text{mean of } F1, \ u2 = F2 - \text{mean of } F2 \), \( F1 \) – Obtained result and \( F2 \) – Ground truth.

\( Fn = \text{False negative}: \) Object pixels incorrectly classified as background.

**Table 1:** No. of frames, duration and file size

<table>
<thead>
<tr>
<th>Sl. no</th>
<th>Input video</th>
<th>No. of frames</th>
<th>Duration</th>
<th>File size</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>inp1.avi</td>
<td>31</td>
<td>2 sec</td>
<td>181 kb</td>
</tr>
<tr>
<td>2</td>
<td>inp2.avi</td>
<td>287</td>
<td>19 sec</td>
<td>558 kb</td>
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</table>
Table 2. Entropy and Correlation coefficient

<table>
<thead>
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<th>input video</th>
<th>Entropy</th>
<th>correlation coefficient</th>
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<td>0.2959</td>
<td>0.8861</td>
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<tr>
<td>2</td>
<td>inp2.avi</td>
<td>0.1554</td>
<td>0.68</td>
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Table 3. Mean square error

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<th>MSE</th>
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</thead>
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<tr>
<td>2</td>
<td>inp2.avi</td>
<td>0.0175</td>
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Table 4. PSNR

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<th>PSNR</th>
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</thead>
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<tr>
<td>2</td>
<td>inp2.avi</td>
<td>65.6886</td>
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</table>

Bar-chart 1. shows recall, precision, F1 and similarity

6. CONCLUSIONS

This paper implements a real-time method having accuracy in detecting and tracking moving body. The combination of background subtraction and tracking, i.e., tagging to moving body which results in the exact determination of moving object in video stream of indoor as well as outdoor environments.

REFERENCE

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