Detection of Moving Object Using Background Subtraction in CWT Domain

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Abstract – Now a day’s Video surveillance used many applications like security, law enforcement and military applications. Smart video surveillance needs an efficient algorithm for detection of moving object and background elimination. This paper proposes the detection of moving object in complex wavelet domain using background elimination. Median filter and morphological filter are used for noise elimination to get clear moving object. The proposed analysis shows that used methodologies are better in comparison with existing methods.

Keywords – DT-CWT, Frame Differencing, Median Filter, Morphological Filter.

I. INTRODUCTION

Identifying moving object is very difficult task in video surveillance. Detection of object and background elimination are the important parameters in video surveillance. Object Detection finds the path of moving objects from video. Video segmentation is used to separate the video into moving objects from foreground and background. Background initialization done by selecting start frame. Each video frame compared with reference frame. Resulting output shows the appropriate moving object. Segmentation is not the easiest process, It faces many problems due to changing background, clutter, poor environmental state such as rain, camera angle, snow, height, fog etc. [7-9].Segmentation has different proposed methods like Pixel classification based methods, Color image segmentation, Threshold based methods, Edge detection based segmentation, Range image segmentation [9]. Low speed, unreliable segmentation, detection of object with noise is the drawback of above all methods. Approximate Median Filtering is used in Daubechies complex wavelet domain for segmentation and its performance reduces the noise [1]. This paper proposes DT-CWT technique to enhance the detection in moving object and identification [4]. Also morphological erosion and dilation techniques are performed for noise elimination and object edge smoothness.

The quality performance of above methods has measured in the form of mean square error (MSE), entropy, peak signal to noise ratio (PSNR) and correlation coefficient. According to measured parameters used techniques performing better.

The paper represented as follows: Section 2 shows detailed explanation of proposed technique. Section 3, 4 gives the details of Experimental output and performance parameter estimation. Conclusion is given in section 5.

II. PROPOSED TECHNIQUE

A. System Design

The paper proposes the methods for identification of moving object from video with background elimination procedure in complex wavelet domain. Frame differencing used for background elimination. For object edge smoothening morphological erosion and dilation operation is performed. The block diagram of the used technique as given in fig. 1.

B. Background Subtraction

To get moving object background subtraction plays major role. Frame differencing is used to find difference between existing frame and the reference frame. The frame difference technique is very common technique. This method work on pixel-based difference to get the moving object. Fig.2 shows the process flow for background subtraction.
C. Dual Tree Complex Wavelet Transform (DT-CWT)

The Dual Tree complex wavelet transform (DT-CWT) expansion of discrete wavelet transform (DWT). The limitations of DWT like shift invariant and directional selectivity overcome by DT-CWT. Dual Tree complex wavelets transforms manage to get good results while maintain a reasonable amount of redundancy. Initially image is divided in to different sub bands of images by using DT-CWT namely, LL, LH, HL, and HH. This is used to set the messages in the pixel coefficients of sub bands. Low frequency sub band represents important part of the image. The edge information and noise element of input image present in high-frequency sub band. The differences between sub bands are calculated. In order to reduce noise level differenced bands are used. This is done by wavelet shrinkage technique. At the end filtered bands are recalculated and divided with threshold for background elimination to get moving object. Following fig. 3 shows the decomposition flow of complex wavelet transform.

D. Median and Morphological Filtering

Median and morphological filtering is used to remove unwanted noise and pixels. Morphological dilation and erosion techniques are used for object edge smoothness. Addition of pixels to the boundaries of object is done by dilation method, while erosion is used for elimination of pixels. The pixels added by dilation and removed by erosion based on the size and structure of the structuring element mage.

III. EXPERIMENTAL OUTPUTS

The experimental results for moving object detection by using background elimination in CWT domain can depicted in following images. DT-CWT used for segmentation. Median and morphological filters are used to eliminate the noise from the input image. Figure 4 shows the simulated results and figure 5 represents the sub bands of background image in cwt domain.
IV. PERFORMANCE PARAMETER ESTIMATION

Different approaches are available for segmentation algorithm. Every approach has its own advantages and disadvantages. This paper proposes a good segmentation algorithm with best results measured by mean square error (MSE), entropy, correlation coefficient and peak signal to noise ratio (PSNR). Image compression quality checked by Mean Square Error (MSE) and Peak signal to noise ratio (PSNR). Correlation coefficient is a coefficient which calculates the statistical connection between two or more random variables. Entropy characterizes the quality of original image.

Table-1 shows detailed comparisons of parameters with used methodologies as given as below:

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Parameters</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median Filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Morphological Filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median-Morphological Filter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wavelet (DT-CWT)</td>
</tr>
<tr>
<td>1</td>
<td>MSE</td>
<td>0.0555</td>
</tr>
<tr>
<td>2</td>
<td>PSNR</td>
<td>60.6906 (60.2913)</td>
</tr>
<tr>
<td>3</td>
<td>Entropy</td>
<td>0.4043</td>
</tr>
<tr>
<td>4</td>
<td>Correlation Coefficient</td>
<td>0.5678 (0.6417)</td>
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From the numerical results in above table it can be concluded that DT-CWT method has better performance parameters as compared to other methods.

V. CONCLUSION

The paper work presents the frame differencing technique for background subtraction in cwt domain. The simulated result performs better in terms of PSNR, MSE, Entropy, Correlation and also it has less time consumption in consideration [5-6][2-3][10] than existing methods.

REFERENCES

AUTHOR'S PROFILE

Mrs. Shital S. Mulik received her bachelor degree in Electronics Engineering from Mumbai University in 2009. She is Electronics and VLSI Design Technology from Bharati Vidyapeeth College of Engineering, Pune.

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