Shadow Detection using DWT with Multi-Wavelet Selection & user Configurable Variance Parameters

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***Abstract*—** Moving cast shadows are a noteworthy worry in today's execution from expansive scope of numerous vision-based observation applications in light of the fact that they exceedingly troublesome the item characterization assignment. A few shadow identification strategies have been accounted for in the writing amid the most recent years. They are for the most part partitioned into two spaces. One more often than not works with static pictures, though the second one uses picture arrangements, to be specific video content. Regardless of the way that both cases can be similarly dissected, there is a distinction in the application field. The main case, shadow identification strategies can be misused to get extra geometric and semantic signs about shape and position of its throwing article ('shape from shadows') and the restriction of the light source. While in the second one, the primary reason for existing is normally change discovery, scene coordinating or reconnaissance (for the most part in a foundation subtraction connection). In our examination we have fundamentally focusssed on the identification of shadow from the facilitating so as to move article through a video observation test multi-wavelet choice and client configurable difference parameters. In our test client can pick the diverse wavelets and change parameters. Edge model based super determination technique is utilized to improve results. Additionally the impact of advanced watermarking is concentrated on for the super-determined VOP(Video articles planes). Various experiments have been proposed and figured out a best system for video reconnaissance application. Our proposed super determination (SR) system gives preferred results over bilinear and bi-cubic routines.

Keywords- *Shadow removal, Watermarking, Discrete Wavelet Transform (DWT), visual surveillance.*

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I. INTRODUCTION

A developing enthusiasm for the picture and video preparing com-munities is the undertaking of cast shadow recognition. In applications, for example, video observation, movement checking and human movement catch, great division and following of fore-ground items is a center prerequisite. Tragically, moving shadows in these applications may show up as closer view objects, when actually they are brought on by the communication in the middle of light and questions. The powerlessness to recognize frontal area protests and shadows can bring about extreme issues, for example, item consolidating, false division and distinguishing proof disappointment, all of which essentially influence execution. In this manner, shadow location and evacuation is an essential and important errand.

Video Surveillance is an essential use of Computer Vision for an association, from the security perspective. This is one application where a computerized framework can supplant individuals, and also have inputs which are unrealistic through human observation alone. A shadow happens when an item in part or thoroughly blocks direct light from a wellspring of brightening. By and large, shadows can be isolated into two noteworthy classes: self shadows and cast shadows. A self shadow happens in the bit of an item which is not lit up by direct light. A cast shadow is the range anticipated by the article toward direct light. Cast shadows can be further ordered into umbra and penumbra area, which is an after effect of multi-lighting and self shadows additionally have numerous sub-locales, for example, shading and bury reflection. Beneath figure1 indicates diverse sorts of shadows.

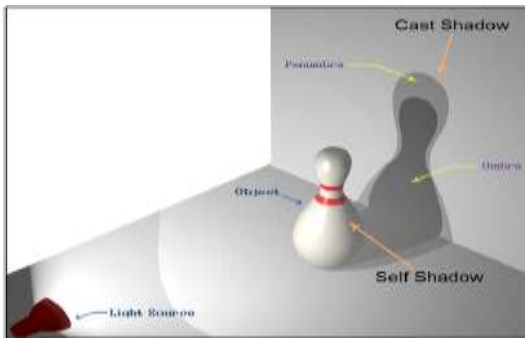

Figure 1: Different types of Shadow

II. LITERATURE REVIEW

We at first made an audit out of existing advancements of modified visual evaluation of works that are as of now accomplished for the identification of shadow from a moving or a stationary item. Identifying areas that relate to moving questions, for example, vehicles and individuals in characteristic scenes is a huge and troublesome issue for some vision-based applications. The extraction of the moving area is the initial step to find where a moving shadow can be recognized. The most used techniques for motion segmentation are:

(i) Background subtraction,
(ii) Frame differencing, (a combination of both), or
(iii)Optical flow.

Movement division in view of optical stream utilizes qualities of stream vectors of moving items after some time

to recognize change locales in a picture succession. These systems can portion moving items in video groupings even from a moving camera. In any case, the greater part of these techniques are computationally profoundly costly and exceptionally delicate to clamor. Fundamentally, the approach behind any foundation subtraction system comprises in subtracting a model of the static scene "foundation" from every casing of a video arrangement. As a rule, a foundation subtraction strategy can be partitioned into three stages: to begin with, the era of a suitable reference model, ordinarily called foundation (preparing stage); second, the estimation method or arrangement (running stage) lastly; the model support (upgrading stage).

Figure 2: Negative effect of shadow in surveillance scenarios

III. OBJECTIVE OF OUR WORK

Shadow location utilizing DWT with Multi-wavelet choice intends to identify and expel shadow from a moving item which is itself an extreme errand. Video information is given to UI which has been produced with the assistance of MATLAB and after that utilizing DWT and Image subtraction technique, shadow is distinguished and after that expelled from the Image, it is so on the grounds that here at first the video test is separated into different picture pixels. At that point in the wake of uprooting the shadow the article is taken to be in thought. Various experiments have been proposed and discovered a best system for video observation application. Our proposed super resolution (SR) method gives better results than bilinear and bi-cubic methods.

IV. PROPOSED WORK

Our test setup is essentially programming based framework in which a UI is produced in MATLAB which is appeared in Figure 3, through this video test is taken as information and experienced specific number of steps that we will see quite recently and after that we will acquire the article picture which is without shadow and through we can undoubtedly decide the real measurements of the item.

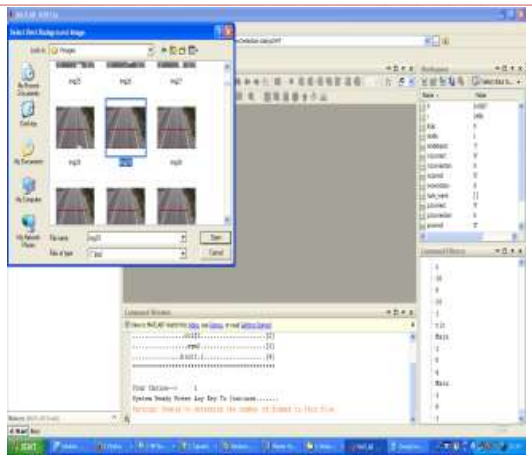

Figure 3: UI of the system

The process of the software module is characterized in various numbers of steps which is mentioned below:

1. *In the first step we have to clear all the variables and handle it.*
2. *Delete all the files from the Directory V image, F image, FWS image.*
3. *From UI go to file Menu and select video input file.*
4. *Using video reader object read Video file into different matrix.*
5. *Matrix will be in the form of loop from 1 to No. of trees.*
6. *In image variable read I frame and also write into v-image.*
7. *Take background image from the user.*
8. *Then shorting of the files will be done mathematically.*
9. *The background image converted into HSV format.*
10. *Loop will be initiated now to read all the files and converts into HSV.*
11. *Then value of ΔH, ΔV and ΔS will be calculated.*
12. *Now transformation of wavelet is done into DWT.*
13. *Calculation of standard deviation.*
14. *Mean of CAV stored in mean.*
15. *Calculation of standard deviation which is ration of standard deviation of mean.*
16. *Now same procedure of CAS value is obtained.*
17. *The obtained result categorized in two different sections, first in which only standard deviation considered and the second one in which Both standard and mean deviation considered.*
18. *Now the work is done on Mode 0 which is used to calculate front image without shadow.*

Above mentioned steps are very important and just with the help of this image we can find out the shadow from a moving object.

V. METHODOLOGY AND PROCEDURE ADOPTED

After going through the several procedures and adopting a sequel work flow result of our research project has been achieved in MATLAB GUI where we can study about the faults and misbehavior of the system which will be described soon in this section. At first we will see the work flow that we have followed in our system and then we will go through the results of the developed system.

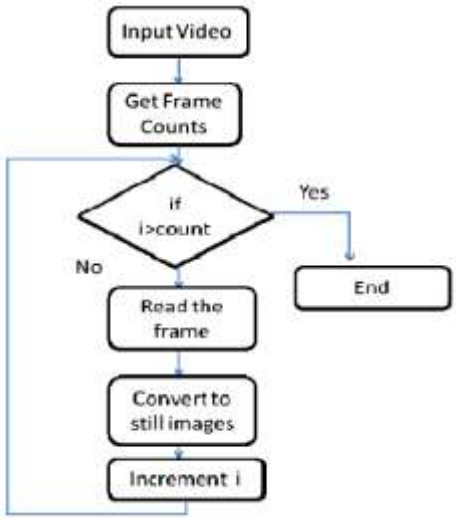

Figure 4: Workflow of the system adopted

In Fig. 4 we can clearly see the workflow of the that at first as a input Video sample is taken and then it is divided in frames and there the frames were studied and shadow were removed from the image and further increment were done in the system and thus the whole process goes on.

The achievement of the methodology depends essentially on the precise determination of competitor relative parameters of wavelets, for every piece pair in the pixel or the change spaces with which to test the area relative condition. As video information is naturally boisterous, this recommends evaluating applicant qualities utilizing factual measures that have mistake and commotion diminishing properties. To this impact in the DCT area the DC quality and the aggregate of the air conditioner qualities recommend powerful estimations, while in the DWT space, the LL worth and the whole of LH, HL, HH values likewise propose successful estimations. In the event that we apply Sobel administrator specifically, we will get numerous circles inside the edge map which will prompt much multifaceted nature to get the outcome. So after morphological operation, Sobel administrator is utilized to get article edge map.

Contributions of this work can be summarized as follows:

1. A method for shadow detection and removal from moving object which is based on DWT complex wavelet transform has been presented.
2. Coefficient of variation is used as a new threshold because it is more informative and more consistent.
3. The threshold is automatically determined and does not require any supervised learning or manual calibration.
4. The proposed method does not depend on any other parameter except complex wavelet coefficients.
5. The proposed method has been evaluated for a number of video sequences and is found to have better performance in terms of a three performance metrics (shadow detection rate, shadow discrimination rate and paired *t*-test) as compared to representative state-of-the-art methods.
6. The proposed method performs well for, both, indoor and outdoor types of video sequences.

In our Methodology we are utilizing DWT which actually implies Discrete Wavelet Transformation which likewise changes over the picture from the spatial area to recurrence space. As indicated by the Fig. 5, the picture is isolated by vertical and even lines and speaks to the first-request of DWT, and the picture can be isolated with four sections those are LL1, LH1, HL1 and HH1. In extra, those four sections are spoken to four recurrence territories in the picture.

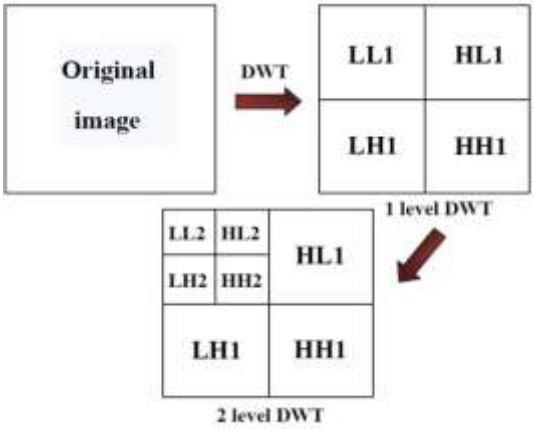

Figure 5: Frequency Distribution of DWT

VI. RESULTS AND IMPLEMENTATION

In this section we will discuss the overall implemented result of our running system. Each output and the process of the system will be observed with the relevant snap-shots. Let's study each of them steps vise. UI which has been used in this Experiment is MATLAB based software. The software that we have developed here is named as Shadow Detection using DWT with Multi-wavelet selection and User-configurable variance parameters. And the complete process of our research are involved in this software step wise which begins from the input of the video sample and

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the final output which will be stored in Fimage, Vimage and FWS image.

As we know in our system it's completely custom automated, means here user can input the video file through which the shadow is removed from the object and real object shape size will be determined. We will see the complete procedure now with the help of screenshots that we have taken through compilation of the software.

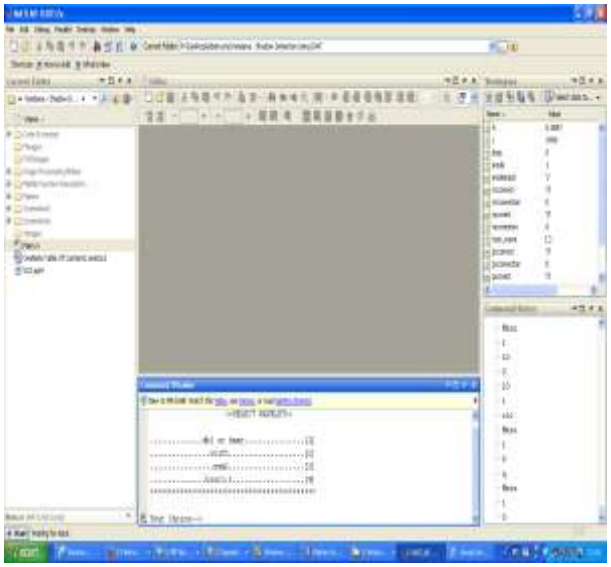

Figure 6: Selection of suitable wavelength manually

After selecting the proper wavelength and video sample, video is broken into various frames and among them suitable image is taken for the background.

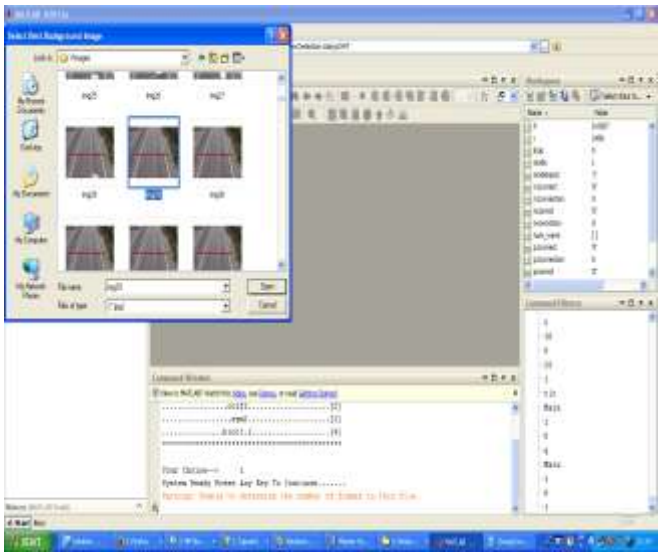

Figure 7: selection of Background Image from video sample

Above obtained figures are the results which are obtained detecting shadow from the colored video sample. Each steps of the result is presented above step by step through suitable diagrams, all the results are obtained in the UI which is developed by us in MATLAB.

We will now see the results which are further obtained after breaking the video sample in different images.

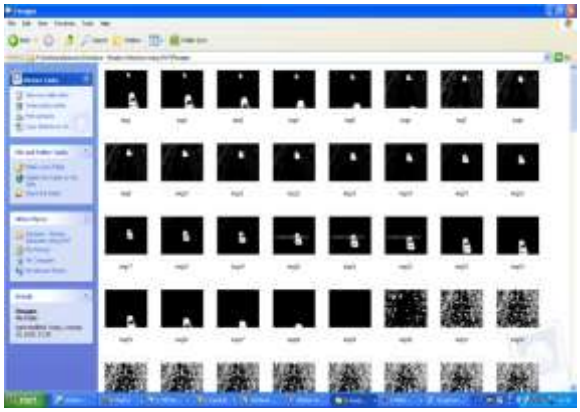

Fig.8: Frames obtained from video Sample and stored in Fimage

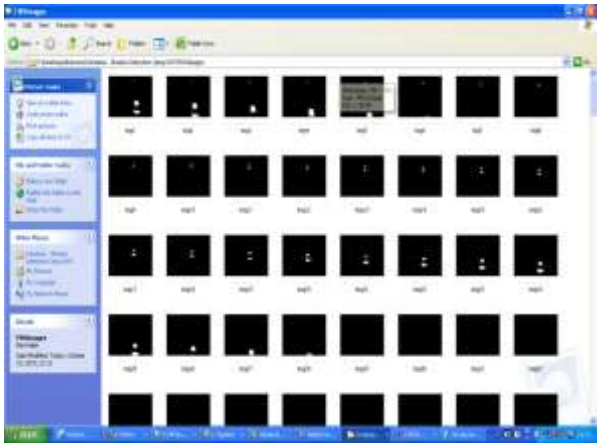

Fig. 9: Shadow image (White shade) stored in FWS folder

VII. CONCLUSION

Based on the above experiments and results our system find out the shadow from a moving object with the help of a video sample and by breaking it into frames by using DWT method which is one of the best method and we are also facilitates the user to select the suitable wavelength and frequency manually.

Our proposed structure will subsequently audit the shadow which is in like manner finding in moving picture, and extremely complex to discover the shadow. At long last, shadow location and recreation is done in exceptionally successful and proficient route by utilizing above improved strategy. Complex wavelet change is in including with above strategies give more dependable structural planning to proposed calculation. Consolidating the shadow properties and ghostly qualities of articles, this idea is proposed to use thresholding strategy and morphological separating to

distinguish shadows. To remake the hidden scene pixels of shadows in effective way, shadow recreation calculation taking into account the sample learning technique and a MRF is produced alongside CWT.

VIII. FUTURE WORKS

Since we know that the experiments and research have no end points so we can have some future works.

Testing future work in this field can be the circumstances when we have two light sources and getting two shadows for single articles. By and large these circumstances happen when we stroll in the city in night and we get our two shadows in view of persistent road lights remaining from beginning stage to end point.

At long last we can actualize this procedure into a robotized robot which will walk like an individual. It will discover the way itself. In the event that it experiences a deterrent, it will recognize it and get interchange way. Additionally on the off chance that it recognizes shadow, it won't trouble and traverse it without straying.

IX. REFERENCES

[1] Ariel Amato, Ivan Huerta, Mikhail G. Mozerov, F. Xavier Roca and Jordi Gonz`alezMoving, ”Cast shadow Detection method for Video Surveillance Applications” Vol. 13 August 2001.

[2] Andrea Prati, Ivana Mikic, Mohan M. Trivedi and Rita Cucchiara. Detecting Moving Shadows: Algorithms and Evaluation. IEEE Transactions on Pattern Analysis and Machine Intelligence, vol.25, no. 7, July 2003.

[3] Jaakko Astola, Petri Haavisto and Yrjo Neuvo. Vector Median Filters. Proceedings of the IEEE, Vol. 78, No. 4, pp. 678-689, 1990.

[4] N Nikolaidis and I Pitas. Digital Image Watermarking: an Overview. IEEE International Conference on Multimedia Computing and Systems, vol. 1, pp.1 – 6, 7-11 June, 1999.

[5] Nanzhi Jiang, Renbiao Wu and Jian Li. Super Resolution Feature Extraction of Moving Targets. IEEE Transactions on Aerospace and Electronic Systems, vol. 37, no.3, pp. 781-793, 2001.

[6] Alwyn Roshan Pais, John D¨Souza, Ram Mohana Reddy and Sandip Patil. Super Resolution of Video with Sharpened Edges Using Multiple Frames - A Novel Approach. International Conference on Advances in Recent Technologies in Communication and Computing, pp. 98-102, 27-28 Oct, 2009.

[7] Shoaib M, Dragon R, Ostermann J. Shadow Detection for Moving Humans using Gradient-Based Background Subtraction. IEEE International Conference on Acoustics, Speech and Signal Processing, ICASSP, pp. 773-776, 2009.

[8] Liang Xu, Liang Zhang, Ping Han, Ren-biao Wu. Adaptive Threshold Shadow Detection Based On Image Block Statistics. ICSP Proceedings, 2008.

[9] Song Xuehua, Ding Yan, Gen Jianfeng, Chen Yu. Shadow Removal of Vehicles in a Video System Based on RGB Chroma Model. International Conference on Computer Science and Software Engineering, vol.1, pp. 977-980, 2008.

[10] R Cucchiara, C Grana, M Piccardi and A Prati. Detecting objects, shadows and ghosts in video streams by exploiting color and motion information. 11th International Conference on Image Analysis and Proceedings, pp. 360-365, 2001.

[11] Y Deng, S Kenney, M S Moore and B S Manjunath. Peer group filtering and perceptual color image quantization. Proc. IEEE International Symposium on Circuits and Systems VLSI , (ISCAS'99), Orlando, FL, no. 4, pp.21-24, June 1999.

[12] Yu-Li You and M.Kaveh. Image Enhancement using fourth order partial differential equations. IEEE Transactions on Image Processing, 2000.

[13] Soheil Feizi and Sina Zahedpour. Salt and pepper noise removal for image signals. International conference on telecommunications, pp.1-5, 2008.

[14] James C Church, Yixin Chen, and Stephen V Rice. A Spatial Median Filter for Noise Removal in Digital Images. IEEE southeastcon, pp.618-623, 2008.

[15] Potdar, V M, Han, S, Chang E. A Survey of Digital Image Watermarking Techniques. 3rd IEEE International Conference on Industrial Informatics (INDIN), pp.709 – 716, Aug. 2005.

[16] M D Swanson, B Zhu and A H Tewfik. Robust Data Hiding for Images. IEEE Digital Signal Processing Workshop, pp. 37-40, 1996.

[17] Malay Kumar Nema, Subrata Rakshit, and Subhasis Chaudhuri. Edge Model Based High Resolution Image Generation. ICVGIP, Springer, 2006.

[18] O Javed, K Shafique and M Shah. A hierarchical approach to robust background subtraction using color and gradient information. Proc. of IEEE Workshop on Motion and Video Computing, 2002.

[19] C Staufer, W E L Grimson. Adaptive background mixture models for real-time tracking. Proc. of IEEE Conf. on Computer Vision and Pattern Recognition, Vol. 2, pp. 246-252, June 1999. [20] Rafael C Gonzalez, Richard E Woods and Steven L Eddins. Digital Image Processing using Matlab. Pearson Education, Inc. 2004.

[20] Guangmin Sun and Yao Yu. DWT based Watermarking Algorithm of Color Images. IEEE Conference on Industrial Electronics and Applications, ICIEA, pp.1823-1826, 2007.

[21] Suhad Hajjara, Moussa Abdallah, Amjad Hudaib, Digital image watermarking using localized Biorthogonal wavelets. European Journal of Scientific Research. Vol.26 No.4 pp.594-608, 2009.

[22] Xin Li, Michael T Orchard. New Edge-Directed Interpolation. IEEE transactions on image Processing, vol. 10, no. 10, Oct 2001.

[23] Elena Salvador, Andrea Cavallaro, and Touradj Ebrahimia ,Cast shadow segmentation using invariant color features□,in: Proc. Computer Vision and Image Understanding 95(2004) 238-259