IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 14, Issue 2, Ser. II (Mar.-Apr. 2019), PP 35-38
www.iosrjournals.org

Shadow Detection and Removal using Gaussian Mean Shift based on Scale Invariant Feature Transform

Rakesh Kumar Das[1], Madhu Shandilya[2]
[1,2] Electronics and communication Engineering, M.A.N.I.T, Bhopal, India
Corresponding Author: Rakesh Kumar Das

Abstract: *The extraction of moving articles from their experience is a testing assignment in visual observation. As a solitary edge frequently neglects to determine ambiguities and effectively section the article, in this paper, we propose another technique that utilizes three limits to precisely arrange pixels as closer view or foundation. These limits are adaptively dictated by considering the conveyances of contrasts between the information and foundation pictures and are utilized to produce three limit sets. These limit sets are then converged to create a last limit set that speaks to the limits of the moving items. The blending step continues by first distinguishing limit section combines that are fundamentally conflicting. At that point, for each conflicting limit fragment pair, its related ebb and flow, edge reaction, and shadow file are utilized as criteria to assess the likely area of the genuine limit. The subsequent limit is at last refined by assessing the width of the corona like limit and alluding to the forefront edge map. Test results demonstrate that the proposed strategy reliably performs well under various brightening conditions, including indoor, open air, moderate, radiant, stormy, and diminish cases. By contrasting and a ground truth for each situation, the shadow detector index-SDI and modified color model index-C_3* demonstrate a precise recognition, which show considerable improvement in examination with other existing strategies.*

Keywords: *Boundary evaluation, change detection, curvature, SDI, foreground extraction, thresholds.*

Date of Submission: 15-04-2019 Date of acceptance: 30-04-2019

I. Introduction

Regular picture successions frequently contain at least one moving items playing out a progression of activities before a foundation scene that is practically stationary. It could be a human strolling over the camera's field of view, a gathering of players in a football match-up, or vehicles going along a thruway. As far as PC vision, a moving article is a lot of frontal area pixels that isn't a piece of the static foundation pixel set and changes its situation between edges. On the off chance that we can precisely extricate these moving items from their experience, the ensuing article acknowledgment or following would be massively disentangled. The manner by which these moving items are extricated is normally known as forefront extraction in applications, for example, visual observation and astute UIs. Theoretically, expecting that the foundation is stationary, in the event that we have a duplicate of the foundation, at that point the forefront can be controlled by taking the distinction between the foundation picture and the information picture. Sadly, the issue isn't so direct by and by. In the model-based procedures, an earlier data, for example, 3-D scenes geometry and brightening conditions, is required [1]-[3]. Despite the solid theoretic estimation of the strategy, it is constrained, in light of the fact that the required data isn't in every case simple to have. In different cases, it isn't accessible in any way. Then again, the properties-based strategy utilizes properties of shadow pixels in pictures and does not require any additional data. It is generally utilized for its basic and direct character. It takes full preferences of ghostly highlights of multiband pictures. The two principle factors that influence shadow extraction from the picture histogram are the record chosen from the utilized shading model and the thresholding strategy. Recently created files usually comprise of a proportion of two groups or a component of different groups. A few shading models were utilized by specialists for properties-based strategy for shadow discovery [4]. The utilized the (C1, C2, and C3) shading space for shadow location. The (C3) part is observed to be delicate to shadow, along these lines, it is utilized to separate among shadow and other dim items in the picture. Be that as it may, the primary issue in utilizing the C3 part is its precariousness for certain shading esteems, which prompts the misclassification of non shadow pixels as shadow[5]-[6]. The proposed a proportion between the C3 part to the primary central segment. Be that as it may, surface highlights with high force esteems were effectively identified as shadows.

II. Related Work

High-goals satellite pictures contain a tremendous measure of data. Shadows in such pictures produce genuine issues in arranging and extricating the required data [7]-[9]. Despite the fact that signals recorded in shadow territory are powerless, it is as yet conceivable to recoup them. Huge work is as of now done in shadow discovery course at the same time, arranging shadow pixels from vegetation pixels effectively is as yet an issue as dull vegetation regions are still misclassified as shadow[10]-[12] sometimes. In this letter, another picture file is created for shadow identification utilizing various groups. Shadow pixels are grouped from the record histogram by a programmed edge recognizable proof methodology. The entire methodology is connected on various investigation territories and high correctness is accomplished (normal of 97%). The direct relationship strategy is then connected to repay the arranged shadow pixels. Two standard methodologies of shadow location are then connected to a similar report territories to approve the proposed methodology [13].

Shadow evacuation is attractive as a rule. Shadows are normal in characteristic scenes, and they are known to convolute numerous PC vision undertakings, for example, picture division and item identification. In this way the capacity to produce sans shadow pictures would profit numerous PC vision calculations. Besides, for tasteful reasons, shadow expulsion can profit picture altering and computational photography calculations. Programmed shadow location and expulsion from single pictures, in any case, are exceptionally testing. A shadow is thrown at whatever point an item blocks an illuminant of the scene [14]; it is the result of complex communications between the geometry, brightening, and reflectance present in the scene. Distinguishing shadows is in this manner troublesome as a result of the restricted data about the scene's properties [15].

III. Problem Identification

The recognized issue in existing work is as per the following
1. Shadow Detection Index is low at times.
2. Adjusted C3* Index esteem limited interestingly level shadow.
3. Low light vision shadow not recognize appropriately.

IV. Methodology

The proposed technique is Mean Shift based Scale Invariant Feature Transform (MS-SIFT), which is portrayed through after point.

Step 1: Shadow picture into luminance and chrominance channels utilizing rgb2ycbcr and furthermore acquire singular part channels. Presently, play out the accompanying grouping of ventures of SIFT for discover the keypoint descriptors for chrominance channels.
1. Scale-Space Extreme Detection
2. Keypoints Localization
3. Introduction Assignment
4. Keypoints Descriptor

Step 2: Now apply hereditary calculation technique for upgrade highlight descriptor.
Step 3: Mean move treats the focuses the element space as a likelihood thickness work. Thick areas in highlight space relate to nearby maxima or modes. So for every datum point, we perform slope rising on the neighborhood evaluated thickness until assembly.
Step 4: The stationary focuses got by means of inclination climb speak to the methods of the thickness work. All focuses related with the equivalent stationary point have a place with a similar group.
Step 5: $g(x) = -K'(x)$, we have

$$m(x) = \frac{\sum_{i=1}^{n} g\left(\frac{x - x_i}{h}\right) x_i}{\sum_{i=1}^{n} g\left(\frac{x - x_i}{h}\right)} - x$$

The amount m(x) is called as the mean move. So mean move system can be abridged as: For each point $x_{i.}$
Step 6: Compute Mean Shift Vector (mx_i^t)
Step 7: Move the thickness estimation window by (mx_i^t)
Step 8: Repeat till combination.
Step 9: Now acquire picture as shadow evacuated picture which is shown in Fig.1.

Fig.1. (a),(b),(c),(d) are the input image and (a'),(b'),(c'),(d') are the results of proposed method.

V. Results and Analysis

The fundamental point of distinguishing shadow pixels is to remunerate them so as to accomplish shadow free pictures. Shadow pay is the way toward remunerating the splendor contrast among shadow and non-shadow regions.

The results are also quantitatively computed in terms of shadow detector index(SDI) and modified color model index, the shadow detector index(SDI) and Modified color model index(C_3*) is calculated as[13]

$$\mathrm{SDI} = \left(\frac{(1-\mathrm{PC}_1)+1}{((\mathrm{G}-\mathrm{B})*\mathrm{R})+1}\right) \tag{1}$$

Where R, G, and B are normalized components of red, green, and blue bands, respectively. PC1 is a normalized component of the first principal component.

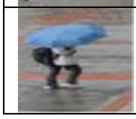
$$C_3^* = \arctan\left(\frac{R_B}{\max\,(R_G, R_R, R_{NIR})}\right) \tag{2}$$

The SDI index and modified color model index for the proposed method and other existing methods are shown in Table I. The overall accuracy is calculated by the following formula:

$$\text{Overall Accuracy} = (TP+TN)/(TP+TN+FP+FN) \tag{3}$$

where FP stands for the number of no-change pixels incorrectly detected as change, FN stands for the number of change pixels incorrectly detected as no-change,and TP represents the number of change pixels correctly detected.

Table 1: Accuracy analysis on the basis of SDI and C_3* index

Input Image	Overall Accuracy[21]		Overall Accuracy proposed	
	SDI	C_3*	SDI	C_3*
	97.96	94.95	98.01	95.01
	96.73	93.21	97.21	94.7
	96.76	94.53	97.09	96.01
	97.06	94.59	98.11	95.7

On the basis of above proposed table the graph is drawn between shadow detector index and MS-SIFT(proposed) which is shown in Fig.2.

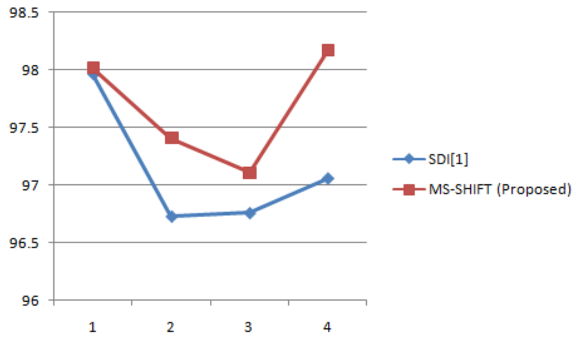


Fig.2. Comparison graph between SDI[13] and MS-SIFT (Proposed)

Above graph clearly shows that, proposed work improve accuracy rate in shadow detection process.

VI. Conclusion

Another methodology for shadow recognition is exhibited and approved. In the exhibited methodology, a picture record, named SDI and modified color model index, is created. Shadow pixels will accomplish high qualities in the created record. These pixels are then separated from the list histogram utilizing a specific edge. A normal in general exactness of 98% is gotten by applying the proposed methodology on four territories of concentrate with different land spread.

References

[1]. P. Sarabandi, F. Yamazaki, M. Matsuoka, and A. Kiremidjian, "Shadow detection and radiometric restoration in satellite high resolution images,"in Proc. IEEE IGARSS, vol. 6. Sep. 2004, pp. 3744–3747.

[2]. Y. Wang and S. Wang, "Detection and compensation of shadows in high resolution remote sensing images using PCA," J. Appl. Sci., vol. 28, no. 2, pp. 136–141, 2010.

[3]. J. Jianguo, T. Yuan, W. Mifeng, Z. Yingchun, and Y. Ting, "A shadow detection algorithm for remote sensing images," J. Comput. Inf. Syst., vol. 9, no. 10, pp. 3783–3790, 2013.

[4]. M. Besheer and A. Abdelhafiz, "Modified invariant colour model for shadow detection," Int. J. Remote Sens., vol. 36, no. 24, pp. 6214–6223, 2015.

[5]. H. Ma, Q. Qin, and X. Shen, "Shadow segmentation and compensation in high resolution satellite images," in Proc. IEEE IGARSS, vol. 2. Jul. 2008, pp. 1036–1039.

[6]. H. Song, B. Huang, and K. Zhang, "Shadow detection and reconstruction in high-resolution satellite images via morphological filtering and example-based learning," IEEE Trans. Geosci. Remote Sens., vol. 52, no. 5, pp. 2545–2554, May 2014.

[7]. J. Li, Q. Hu, and M. Ai, "Joint model and observation cues for single image shadow detection," Remote Sens., vol. 8, no. 6, p. 484, 2016.

[8]. S. Wang and Y. Wang, "Shadow detection and compensation in high resolution satellite image based on retinex," in Proc. 5th Int. Conf. Image Graph., Xi'an, China, 2009, pp. 209–212.

[9]. D. Guangyao, G. Huili, Z. Wenji, T. Xinming, and C. Beibei, "An indexbased shadow extraction approach on high-resolution images," in Proc. Int. Symp. Satellite Mapping Technol. Appl., 2013, pp. 19–26.

[10]. Q. Ye, H. Xie, and Q. Xu, "Removing shadows from high-resolution urban aerial images based on color constancy," in Proc. Int. Arch. Photogramm., Remote Sens. Spatial Inf. Sci. (ISPRS), vol. 39. Melbourne, VIC, Australia, Sep. 2012, pp. 525–530.

[11]. J. Su, X. Lin, and D. Liu, "An automatic shadow detection and compensation method for remote sensed color images," in Proc. 8th Int. Conf. Signal Process., vol. 2. Nov. 2006, pp. 1–4.

[12]. M. Herold, D. A. Roberts, M. E. Gardner, and P. E. Dennison, "Spectrometry for urban area remote sensing—Development and analysis of a spectral library from 350 to 2400 nm," Remote Sens. Environ., vol. 91, nos. 3–4, pp. 304–319, 2004.

[13]. Yasser Mostafa and Ahmed Abdelhafiz "Accurate Shadow Detection From High-Resolution Satellite Images", IEEE Geo-Science and Remote Sensing Letters, Vol. 14, No. 4,pp.494-498, April 2017.

[14]. S. K. Mcfeeter, "The use of the normalized difference water index (NDWI) in the delineation of open water features," Int. J. Remote Sens., vol. 17, no. 7, pp. 1425–1432, 1996.

[15]. J. Huang, W. Xie, and L. Tang, "Detection of and compensation for shadows in colored urban aerial images," in Proc. 5th World Congr. Intell. Control Autom., vol. 4. Jun. 2004, pp. 3098–3100.

Rakesh Kumar Das. "Shadow Detection and Removal using Gaussian Mean Shift based on Scale Invariant Feature Transform." IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) 14.2 (2019): 35-38.