IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.8, Issue.3, Mar 2020 E-ISSN: 2347-2693

Design of Enhanced Method for Detection and Removal a Shadow from Video Frames

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DOI: https://doi.org/10.26438/ijcse/v8i3.2832 | Available online at: www.ijcseonline.org

Received: 26/Feb/2020, Accepted: 13/Mar/2020, Published: 30/Mar/2020

Abstract— It is very difficult to remove the shadow from video frames or an image, so we need to find the solution for this. Here we did survey for the required information. Due to the excessive-order textural material within the video frame directly removed the intensity area of the shadow frame is difficult. There are various filters for image segmentation, here we used a mean-shift filter to remove a noise and smoothening of video frame. A region growing algorithm is used for the shadow detection through the user. Using 3D modelling and inpainting, an intensity surface of illumination in the shadow region can be received primarily based on that similar to the equal texture inside the non-shadow one. In comparison to the alternative strategies, this is a user-assisted method that solves a shadow detection problem and applies to the shadow, consisting of various types of textures. In future, when we apply this system for video, this process is well suitable for the less duration video because, for each frame the user gives some important information to the system

Keywords— Mean-shift filter, Region Growing algorithm , Image inpainting, Shadow removal.

I. INTRODUCTION

The presence of a shadow is an almost obligatory optical situation in scenes. Shadow removal before the execution of those obligations will honestly enhance their overall performance. Because of the complexity of various forms of shadows, shadow elimination from a photo or video is challenging, which pertains to many troubles, consisting of lighting fixtures situations form of shadow surfaces, the shape of occluding items, and overall performance of shooting device [1]. A shadow area is typically split into two regions i.e. umbra and penumbra, which are completely occluded light source and partly generated light source respectively, as given in Fig.1. In this, we have used the user-assisted method for mask extraction. The user-assisted method is more flexible as compared to the automatic shadow detection method [2]. The umbra mask of shadow in this study is extracted via region growing algorithm [3]. In that user gives an important information to the system. In comparison to the available strategies, shadow detection is convenient using this user assisted approach. and we strive to model a proper intensity surface in the shadow area using the texture, which is identical to that in the non-shadow vicinity.

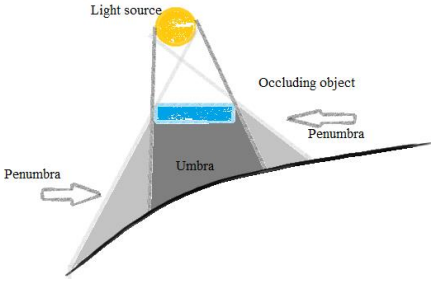


Fig 1. Umbra and penumbra region of shadow

For this reason, the illumination intensity of the shadow area is compensated, after which a high-quality shadow-free image with a consistent illumination can be received. Consider the impact of high-order textural additives inside the original shadow image, the image decomposition method is use to do away the texture detail while keeping the image edge. In this way, the processed image intensity surface is locally clean and can be modeled with a low-order 3D model.

II. RELATED WORK

In this study, as compared with an automatic shadow detection method, the user-assisted approach is more convenient. For removing a shadow, we perform two tasks which is shadow detection and shadow removal. Both performs on a single frame [4],[5],[6],[7],[8]. Shadow detection methods can be divided into automatic strategies and person-assisted approach from the thing of personal interaction [9],[10].

The Author Kai He proposed a system for "single image shadow removal using 3-D intensity surface modeling"[12]. In this study, the author finds a user-assisted method for detecting a region of the shadow. In that start by, users click the mouse in the umbra area and non-shadow region to provide a co-ordinate of pixels. Second, support vector machine training is performed on RGB values within a neighborhood of the supplied coordinates. Then pixels are classified as umbra region and non-shadow region. Region growing used for seed selection. The image segmentation method is used to removing the high-order statistical information such as noise and textural details from the original image.

The author Huifang Li, Liangpei Zhang proposed a method for "An adaptive Nonlocal Regularized shadow removal method for aerial remote sensing images" [13]. This method removes a shadow from remote sensing images which is having a different characteristic than natural images. Image matting is used to easily detect the soft shadow for removing a shadow from aerial image nonlocal operator is used, the soft shadow is brought to replace the traditional binary hard shadow.NL operators are used to regularize the shadow scale and the updated shadow-free picture. The first NL operator regularizing the shadow scale, preserves the edges and the textures in the shadow regions. Combining the first NL operator with the second NL operator avoids over smoothing inside the umbra and under smoothing inside the penumbra. The k-means clustering is used to distinguish the land surfaces and clear boundaries from shadow regions.

Author R.K. Sasi & V.K. Govindan proposed a method for "shadow detection form a single image based on Fuzzy split and merge approach that uses fuzzy predicate" [14]. FIS (Adaptive Neuro-Fuzzy Inference machine). The approach first performs the top-down method that recursively splits the picture into four homogeneous quadtree block and the picture is carefully represented in the tree form then, observe the bottom-up method to merge the adjacent homogeneous area the use of the fuzzy predicate. The comparative has a look at states that the proposed method offers better act in terms of accuracy and performance.

The authors Roshani L Jain, Lubdha M Bendale and Gaytri D. Patil studied on the “Image Enhancement using different Techniques” [15]. Here authors main goal is to enhance the image quality and text present in an image. Various filtering techniques are also used for develop an image quality.

The author Palak kumar and Vineet Saini researched on “An Efficient Image Sharpening Filter for Enhancing Edge Detection Techniques for 2D, High Definition and Linearly Blurred Images” [16]. To detect the boundaries between different textures is useful in the computer vision. To detecting the edge may cause filter the unwanted information. In this paper the updating of edge detectors is done to upgrade their detection accuracy.

From the literature survey, it has been found that the textural information in the penumbra region is lost and does not perform well for most shadow video-frames and the problem of illumination inconsistency, so to overcome this we propose our method for shadow removal in video frames/images.

ROBLEM STATEMENT

To design an enhanced method for detect and remove a shadow from video frames.

OBJECTIVES

• To detect the shadow from the video frame.
• To perform the detection and produce the smoothened image, we used the mean-shift filter.
• To remove a shadow from a video frame.
• To preserve the textural characteristics of the image after removal of shadow from the image/video frame.

III. METHODOLOGY

Image Smoothening:
Mean-shift filter has used to level the image. Texture in the shadow image has removed while preserving the edges of the shadow. A mean-shift filter is used for the image smoothen i.e., cartoon image. Edges of the image are preserved and the surface in the shadow area and non-shadow area is smoothened.

Region Growing:
Region growing method is a Straight forward an area-based segmentation method. It is also categories as a pixel-based approach because it involves the choosing of beginning seed points. This method to segmentation test nearest pixels of starting seed points and decide whether the pixel neighbours should be adding on to the region. The process is repeated on, similar to common data clustering algorithms.

Image Inpainting:
Image inpainting is a process of reorganizing lost or collapse parts of images and videos. It is an important process for editing and enhancing an image. There are various applications of inpainting it is used for photoshoots, movies, cinema restorations, removing red-eye, and removing logos in videos, etc.

Shadow Detection:
Here Shadow mask is detected by the detection of shadow area and non-shadow area. The shadow area is known as a modeled zone and the non-shadow region known as the modeling zone and the shadow is detected through the non-shadow region. A region-growing phase is initiated on the selected coordinates. In the region growing phase, new pixels labelled as umbra are added to the umbra mask. Non-shadow labelled pixels are added to the non-shadow area. Modelling zone M can be detected with the same surface/texture. For penumbra region calculation Markov Random Field modelling as the native image and umbra regions are considered. Shadow mask S is the combination of umbra mask and penumbra mask. Shadow is detected. Shadow mask S is the combination of umbra mask and penumbra mask. Shadow is detected.

Test points Selection:
The test points are selected uniformly from the non-shadow regions. The selection of test points from the original video-frame is done by use a Radial Basis

Function. In this module, set the modeling zone (i.e. non-shadow) and modeled zone (i.e. shadow region). Shadow mask can be derived using umbra and penumbra region in an image. Both together the umbra and penumbra can be calculated by applying the support vector machine and Markov Random Field modeling (MRF). The sampling interval of test points is calculated by,

$$dk = \text{round}\left(\frac{\max((lk)+\min(lk))}{c}\right), k=1,2$$

Where k=1 is vertical direction and k=2 is a horizontal direction. dk is the interval between test points that are selected in different directions. lk is the number of pixels in relative directions. A max and min are the levels respectively, the round is the rounded operator and c is constant.

Intensity Surface Modelling:

Each RGB channel, model the intensity surfaces in the shadow region based on that in the without-shadow region with the same texture. The modelling of intensity surface modelling can be achieved by the following steps:

Step1: Determine RBF and set the shadow and without-shadow regions. Select the test points uniformly from the modelling region i.e., to compare the test points and set.

Step 2: Create matrix A based on the calculation of redial distances between each two test points in the set,
Where the radial distance between and test point.
Step 3: Values are assigned to each test points, Establish matric U

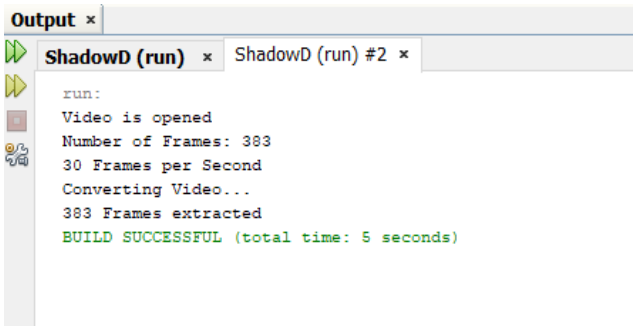
Where represents the intensity values of the test point.
Step 4: Obtain the parameters of matrix C on the calculation of. Matrix C is composed of N parameters
Step 5: Calculation of radial distances between any points in the modeled region and each test point and create the matrix. Represents the radial distance between and test point Intensity values of point can be calculated as follows
.
Step 6: Step 4 and step 5 are repeated until the entire intensity values in the modeled region are calculated.

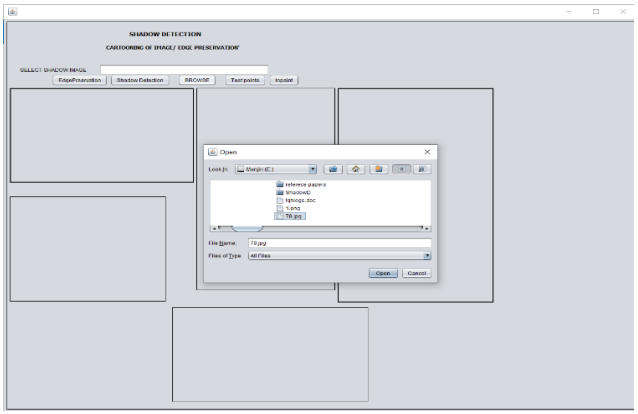
Shadow removal:

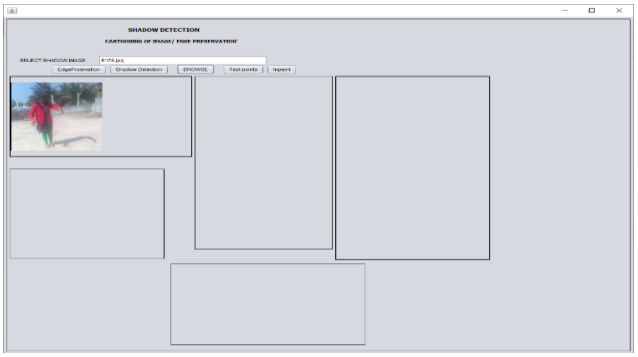
As the intensity values of the shadow region are calculated then the shadow region will be represented through any RBG channel to represent the shadow region from the non-shadow region. The shadow is removed. But after the shadow removal shadow region doesn't contain any background texture. Image inpainting can be used to preserve the textural details of the video frame; it adjusts the pixels of the non-shadow region to the removed shadow region. Adjusting of pixels can easily preserve the texture of the video frame. As this in painting techniques restore the lost texture in the video-frame.

IV. RESULTS AND DISCUSSION

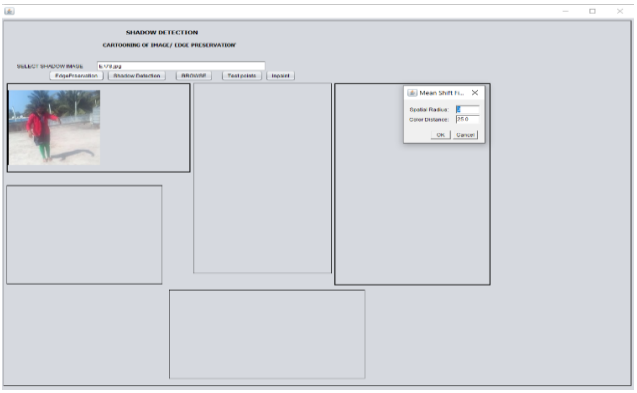
Here removes a shadow from frame only, not in the video, for video there is a lot of problems that occur but we still trying.
Firstly, we convert a video into frames.



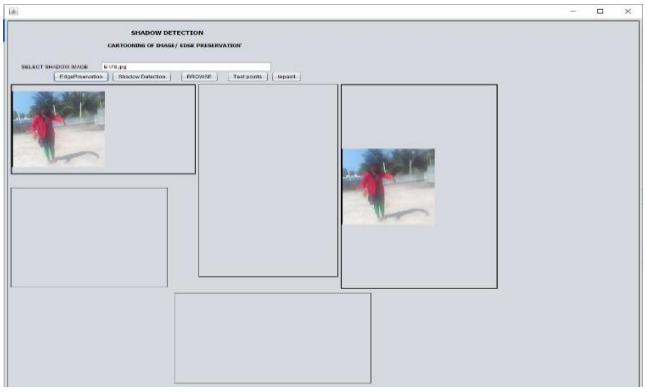




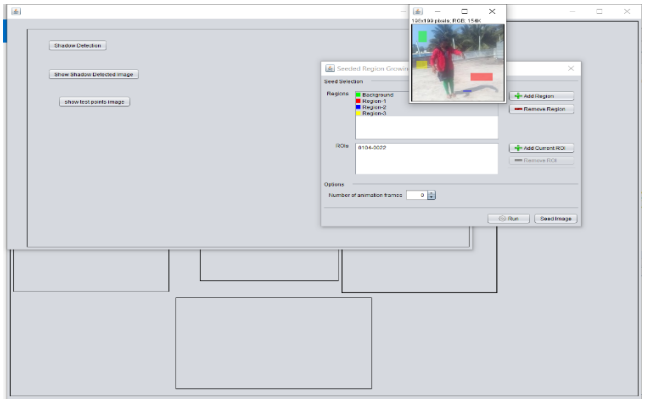
Browse a frame from folder and then apply edge preservation on frame.

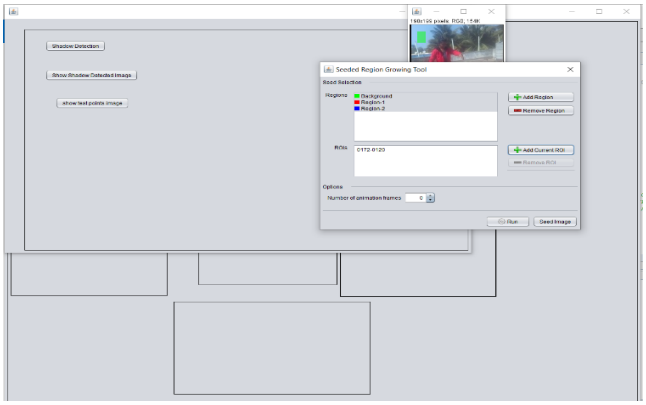


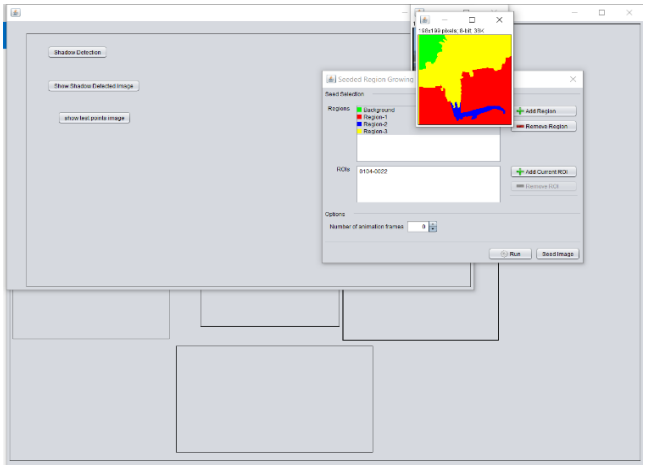
To preserve the image, here we used a mean shift filter.



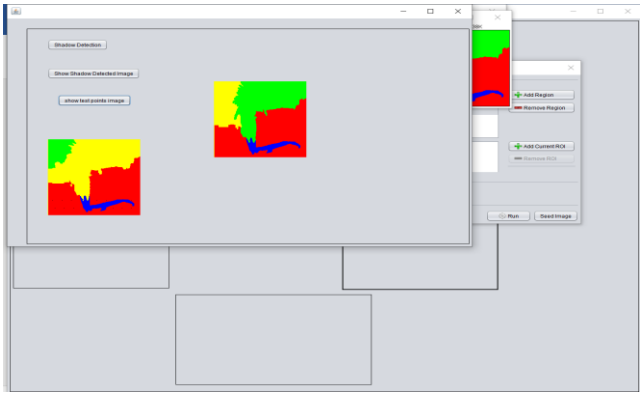
Then shadow is detected by user assisted method. The region growing algorithm is used for shadow detecton.





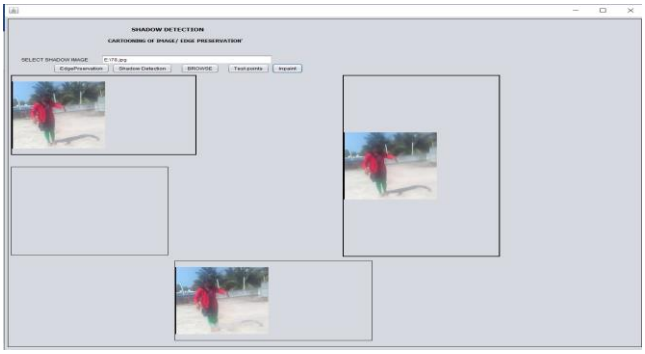


Detected image is shown in regions.



Then we calculate the test points from regions detected in region growing methods that help us to remove a shadow.

The next process is removing a shadow from the image. To click on button inpaint then inpaint process remove a shadow from the video frame.



Input:

Obtained result:

V. CONCLUSION AND FUTURE SCOPE

In this study, we convert a video into frames. Mean-shift filter is used to remove a noise from frame. With region growing algorithm we detect a shadow with user-assisted approach. In that, user provide some data to system for region separation. Image inpainting technique is used for removing a shadow from the frames. It is suitable for frame or a single image but some limitations is for video, for maximum duration video it requires more time. In future, this approach applies for shadow remove from a video.

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Authors Profile

Mamata S. Kalas, have been graduate from University Of Mysore, in 1993, From B.I.E.T, Davangere, started her professional career there itself. In 1995, came to kolhapur, after her marriage and since then she has worked as lecturer at D.Y.Patil's college of Engg., Bharati Vidyapeeth's College Of Engg., Kolhapur. She did M.Tech(CST) Graduate and her dissertation work is based on image segmentation using parametric distributional clustering. She has been awarded with M.TECH (CST) from Shivaji University, Kolhapur of Maharashtra in June 2009. She is awarded Ph. D in computer science and Engineering at Walchand College of Engineering, Reseach center, Shivaji University, under the guidance of Dr.B.F.Momin. She is currently working as an Assistant Professor at KIT'S College of Engg, Kolhapur. She is in her credit, 16 Years of teaching experience, Two Papers presented for international conferences, three papers presented for national conferences, seven papers published in international journals. Her areas of interest are pattern recognition and artificial intelligence, computer architecture, system programming.

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