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Removal of Fence from Digital Images

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Abstract: - **Many places e.g. parks, gardens, zoos and historical places are guarded by fences. The images captured at these places are occluded with a fence. This affects the authentic appeal of the image. So, removal of the fence form those images are required. In this paper, a novel algorithm is proposed for the removal of the fence from the digital images. The fence in the image is segmented by using the multiple threshold values. The segmented fence is used as a mask for the restoration of the image from the fence occlusion. The fence occluded region is restored by using the hybrid inpainting technique. The proposed algorithm is tested on a wide verity of images. Comparative results are provided to demonstrate the effectiveness of the proposed algorithm.**

Keywords: - **Occlusion, Segmentation, Inpainting, Restoration.**

I. INTRODUCTION

Tourists capture their cherished moments at historical places or monuments during their travel. In recent days, for the security concern, these types of places are barricaded for protection. Fences have grown to be fashioned, restricting access to the public and affecting the aesthetic experience of the tourist who needs to maintain his/her recollections for posterity using images. Sometimes fences are essential to protect from a danger such as wildlife animals in the zoo. However, one would select to enhance the aesthetic appeal of the captured images of those animals by removing the interfering fences/barricades.

In previous work [1], the string-like occluding regions and fence structures are detected by a circle contrast and the missing areas are inpainted by neighbouring interpolation. The algorithm proposed in [1] is applied to the grayscale images. The algorithm proposed by Liu, et al. [2] considered the fence as a deformed lattice, based on the regularity of the structure fence detected. The image is restored from the fence by using the Criminisi, et al. inpainting algorithm [3]. The fence detection technique proposed by Liu, et al. [2] is failed even for some regular pattern fence detection. The algorithm proposed by Liu, et al. is improved by Park, et al. in [4] and also multi-view inpainting algorithm is proposed for the restoration of the image when multiple images of the same scene are considered. For single view images Criminisi, et al. inpainting algorithm [2] is used for the restoration of the image from fence occlusion. In literature, some more algorithms are presented for near-regular pattern fence detection [5-7]. The image de-fencing algorithm proposed by Farid, et al. [8] is applied to both regular and irregular fence pattern detection. This algorithm requires some user marked points on the fence in order to segment the fence from the image. Farid, et al. proposed hybrid inpainting algorithm for the restoration of the image from the fence occlusion. The fence detection algorithm in [9, 10] uses multiple images of a scene, for fence detection. It uses three different images first one with fence out of focus, the second one with a fence in focus, and the third one with the flashlight. The background is recovered from the image with the out-of-focus fence. This paper presents a novel image de-fencing technique for the restoration of the image from the fence. This algorithm contains two steps. In the first step, the fence detection and segmentation is done by using the multiple threshold values. In the second step, the image is restored from the fence occlusion using Farid, et al. hybrid inpainting algorithm [8].

II. PROPOSED METHOD

In the proposed algorithm the true color image is converted into YCbCr color channel by using th e eqn.1. This is having a better consistency with the human vision system. It is the linear transformation of the RGB image. But it imitates the properties of the human vision system.

$$\begin{bmatrix} Y \\ Cb \\ Cr \end{bmatrix} = \begin{bmatrix} 16 \\ 128 \\ 128 \end{bmatrix} + \begin{bmatrix} 65.481 & 128.553 & 24.966 \\ -37.797 & -74.203 & 112.000 \\ 112.000 & -93.786 & -18.214 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} \quad (1)$$

Histograms are found for the three channel of the YCbCr image. Minimum and maximum threshold values are selected for each channel of YCbCr. These values are selected based on the intensity variations present in the histograms. These values are used for the segmentation of the fence from the image. The segmentation is done by using the following eqn.2.

$$g(x,y) = \begin{cases} 1, & \text{if } a_{i1} \le f(x,y) \le b_{i2} \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

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Where a_{i1} and b_{i2} are the minimum and maximum threshold values used for the channel 'i'. The values used for each channel are different and these are user dependent. One should be careful while selecting the threshold values. Improper selection may lead to undesired segmentation. That means the segmentation results may contain background elements along with the foreground object. The example considered in the Fig. 1a is the input RGB image which is occluded by the fence. The threshold values used for the segmentation of the fence is 0 and 255 are the minimum and maximum threshold values for Y and Cr channels. 103 and 255 are the minimum and maximum threshold values used for the Cb. The fence mask obtained after segmentation is dilated by using the structuring element [8]. The fence mask obtained after dilation is shown in Fig.1b.The input image shown in Fig.1a is masked with the fence mask shown in Fig. 1b. One can observe the masked image after applying the fence mask as in Fig.1c. The masked fence image is used for the restoration of the image. The image is restored from the fence by using the hybrid inpainting algorithm [8]. One can observe the restored image from the fence as in Fig. 1d.

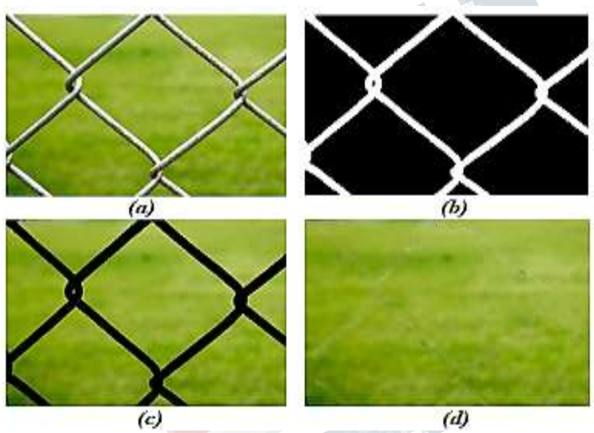

Fig.1(a) Input image with a regular fence, (b) Segmented fence mask, (c) The fence masked image, (d) Restored image from the fence occlusion by using hybrid inpainting algorithm

III. EXPERIMENTAL RESULTS

The proposed de-fencing algorithm is tested on PSU NRT dataset [11]. The effectiveness of the proposed algorithm is tested on a wide verity of images. The results are compared with the Liu, et al. [2] image de-fencing technique. In Fig.2 four examples of Fig.2 (a-d) are shown for the demonstration of the proposed fence detection technique. In Fig.2a vertical bars have occluded the image. The occluded bars are detected by using the proposed algorithm. The fence mask obtained by the proposed algorithm is shown in Fig.2e. The input image is masked with the obtained fence mask. The masked fence image is shown in Fig.2i. The masked fence image is restored by using the hybrid image inpainting technique proposed by Farid, et al. The restored image from the vertical bars is shown in Fig.2m. The input image shown in Fig.2b is occluded by the regular fence. The fence mask obtained by the proposed fence detection technique is shown in Fig.2f. Masked and restored images of Fig.2b are shown in Fig.2j and Fig.2n. The examples considered in Fig.2c and Fig.2d are occluded by a different type of structures. The masks of Fig.2c and Fig.2d are shown in Fig.2g and Fig.2h; masked images are shown in Fig.2k and Fig.2l respectively. Restored images of Fig.2c and Fig.2d are shown in Fig.2o and Fig.2p respectively. Some non-fence pixels are detected as fence pixels by the proposed fence detection technique. This is due to the similarity between the foreground and background.

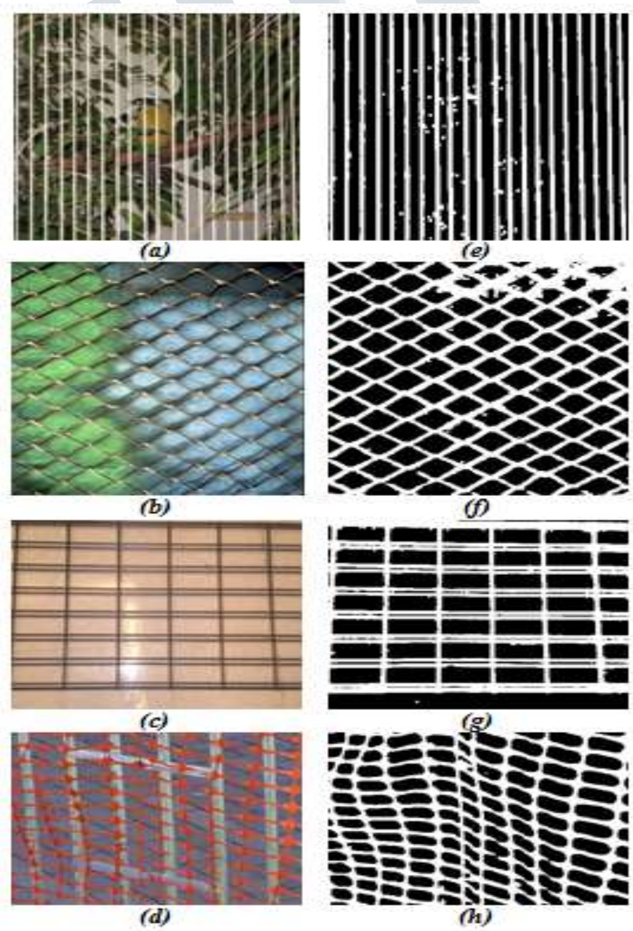

Fig.2 (a-d) Input images, (e-h) Fence mask obtained by the proposed algorithm, (i-l) Masked input images, (m-p) Restored images obtained by hybrid inpainting algorithm.

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The results obtained by the proposed algorithm are compared with the results obtained by the Liu, et al. de-fencing approach. The examples considered in Fig.3 shows that the proposed algorithm detects the fence occlusions effectively compared to the Liu, et al fence detection technique. Fig.3a and Fig.3b are the test images. One can observe from Fig.2c and Fig.2d that the lattice detection algorithm proposed by Liu, et al. is failed to detect the fence. Whereas the proposed algorithm able to detect the fence. The masked images obtained by the proposed algorithm are shown in Fig.3e and Fig.3f. The restored images from the fence occlusion are shown in Fig.3g and Fig.3h.

IV. CONCLUSIONS

In this paper, a novel image restoration algorithm is presented. The input image is restored from the fence and fence-like structures by using the proposed algorithm. The fence in the image is segmented by using the multiple threshold values. The segmented image is dilated by using the structuring element in order to cover the total fence region. The fence mask obtained after dilation is used as a mask for the input image to restore the image from the fence occlusion. The restoration of the image is done by using the hybrid image inpainting algorithm [8]. The results show that the effectiveness of the proposed image restoration algorithm.

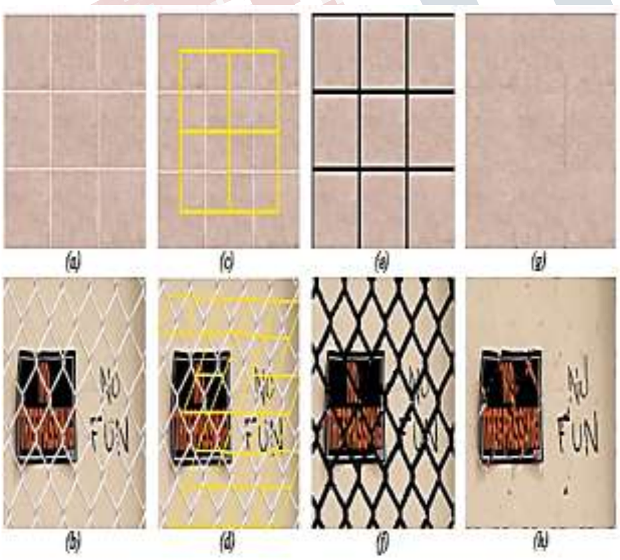

Fig.3 Shows the examples where Liu, et al. algorithm is failed at the detection stage, (a, b) Input images, (b, d) Fence detected by Liu, et al. algorithm is shown in yellow color, (e, f) Fence detected by the proposed algorithm is shown in block color, (g, h) Restored image obtained by the hybrid image inpainting algorithm

V. REFERENCES

[1] T. Tamaki and H. Suzuki, “String-like occluding region extraction for background restoration,” in ICPR, vol. 3. IEEE, 2006, pp. 615–618.

[2] Liu, Y., Belkina, T., Hays, J., Lublinerman, R.: Image defencing. In: Proceedings of the IEEE CVPR, pp. 1–8 (2008)

[3] Criminisi, A., Perez, P., Toyama, K.: Region filling and object removal by exemplar-based image inpainting. IEEE Trans. Image Process. 13(9), pp. 1200–1212 (2004)

[4] Park, M., Brocklehurst, K., Collins, R.T., Liu, Y.: Image de-fencing revisited. In: Proceedings of the Asian Conference on Computer Vision (ACCV), pp. 422–434 (2011)

[5] Hettiarachchi, R., Peters, J., Bruce, N.: Fence-like quasi-periodic texture detection in images. Theory and Applications of Mathematics & Computer Science 4 (2), pp. 123-139 (2014)