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AN EFFICIENT SEGMENTATION OF INSECTS FROM IMAGES USING CLUSTERING ALGORITHM AND THRESHOLDING TECHNIQUES

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ABSTARCT
Image can be represented in the area of Digital Processing, which is an optically formed duplicate or other reproduction of an object. In this paper images are being used in analysing of an Object. Noise means unwanted signal in an Image. Every Image is represented by noise. Salt and Pepper noise has been represented by bright pixels in dark regions and dark pixels in bright regions. Implementation of Noise removal filter filters the unwanted disturbances in the Image. In this work color image segmentation has been extensively applied using K-means Clustering. Color segmentation is done in by color features in the image in order to classify different colors in an Image. Thersholding is the basic approach in Segmenting an image. In this work Otsu Thersholding and Multiple thersholding has been used to segment the Image. According to the intensity value of the pixels the images are being segmented.

Keywords: *Salt and Pepper noise; Color image segmentation ; Thresholding.*

1. INTRODUCTION

Image provides a better study in various areas of research. Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. Image plays a vital role in the study of the objects in an image. Noise is a random variation of image density, visible as grain in film and pixel level variations in digital images. Noise is the disturbance that occurs in the image which reduces the quality of the image. It is a key image quality factor; nearly as important as sharpness.

Noise can be filtered to reduce the disturbances in an Image. Median filter can be used here to reduce the impurities in the image. Hence it works well for the Image taken for segmentation. The goal of image segmentation is to cluster pixels into salient image regions. The quality of the segmentation depends on the image. Segmentation is mainly used to locate object and get the information about that object. The result of image segmentation is a set of segments which entirely covers the object.

K-Means algorithm has been implemented to cluster the color in the image. K-means algorithm is an iterative technique that is used to separate image according to the pixels. These form n clusters. The quality of image depends upon the k means clustering initial set. Thresholding is the simplest form of segmentation. Thresholding produces uniform regions. Otsu method and multiple thersholding is being implemented so as to perform segmentation in the image.

2. METHODOLOGY

A digital image is nothing more than data numbers indicating variations of red, green, and blue at a particular location on a grid of pixels. This figure represents the architecture of the process.

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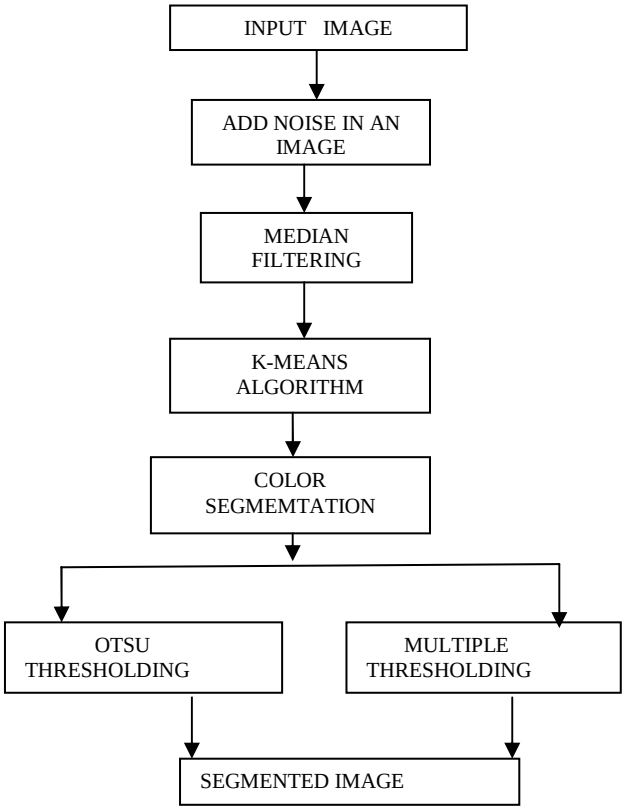

Fig. 1.System Design Architecture

2.1. *Noise*

Noise is only meaningful in relationship to a signal. Noise in an image refers to the disturbance that is caused due to the clarity of the image is being reduced. Noise in an image is tiny, unwanted random pixels in areas where the areas are extremely different. White pixels are referred by black dots and Black Pixels are referred by white dots. In digital format the image is acquired directly which may cause noise.

2.2. *Salt and pepper noise*

Salt and pepper noise is being used here. This noise appears like a black and white dot in the image. Salt and Pepper noise refers to single pixel noise statistics. This type of noise contains random occurrences of both black & white intensity values, and often caused by threshold of noise image. Salt & Pepper distribution noise can be expressed by

$$P(x) = \begin{cases} P1, & x=A \\ P2, & x=B \\ 0 & \text{otherwise} \end{cases} \qquad \text{Eq. (1)}$$

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Where P1, P2 are the Probabilities Density Function (PDF) p(x) is distribution salt and pepper noise in image and A, B are the array size image. In this paper salt & pepper noise in image is randomly occurred in white and black pixels of an image [6]. The main challenge in removing salt & pepper noise from image is due to the fact that image data as well as the noise, share the same small set of values, which complicates the process of detecting and removing the noise.

2.3. *Filtering*

Filtering technique is a technique which removes the unwanted components from the images which cause damage to the clarity of the image. There are various types of filtering that are used to remove the noise in the images. Median filter is being used to reduce the noise. Median filter removes the outliers in the image without reducing the sharpness in the image. Another major use of filtering is to reduce the blur and the specific objects can be highlighted.

2.4. *Median filter*

Median filter is a well known method that can re-move salt/pepper noise from images [2]. The removal of noise is performed by replacing the value of window center by the median of center neighbourhood. Its disadvantage is the distortion of corners and thin lines in the image. Median filtering is a common step in image processing[6]. It is particularly useful to reduce speckle noise and salt and pepper noise.

2.5. *K-Means clustering*

K-means algorithm aims in the partition of n observation into k-clusters. K-Means algorithm is the simplest method in the segmentation technique. Segmentation is used to breakdown the image into smaller components. In this work color image has been segmented from the input image. The color image segmentation has been performed by applying the initial color clusters in the K-Means algorithm.

Algorithm

Let us assume that there are n observations (or) instances{x1, x2, x3……xn}.

Let these be the k representation cluster{c1,c2,c3….cn}. the procedure for the k-means technique is as follows.

Step : 1 The difference between observation and clustering is found.

Step : 2 Assign the observation to the cluster with which the distance is minimum.

Step : 3 Calculate the new mean of the cluster after the observation is added.

Step : 4 Repeat the steps till a predefined threshold is met.

2.6. *Otsu algorithm*

In Otsu's method we can search for the threshold that minimizes the intra-class difference in the class, defined as a weighted sum of differences of the two classes by using the mathematical methodically.

$$\sigma^2\omega(t) = \omega_1(t)\sigma_1^2(t) + \omega_2(t)\sigma_2^2(t)$$

Eq. (2)

Weights ω_i are the probabilities of the two classes separated by a threshold t and σ_i^2 variances of these classes.

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Otsu shows that minimizing the intra-class variance is the same as maximizing inter-class difference:

$$\sigma_b^2(t) = \sigma^2 - \sigma_\omega^2(t) = \omega_1(t)\omega_2(t)[\mu_1(t) - \mu_2(t)]^2$$

Eq. (3)

which is expressed in terms of class probabilities ω_i and class means μ_i.

The class probability $\omega_1(t)$ is computed from the histogram as t:

$$\omega_i(t) = \sum_0^t p(i)$$

Eq. (4)

while the class mean Type this equation here $\mu_1(t)$ is:

$$\mu_1(t) = [\sum_0^t p(i)x(i)] / \omega_1$$

Eq. (5)

where x(i) is the value at the center of the ith histogram bin. Similarly, you can compute $\omega_2(t)$ and μ_t on the right-hand side of the histogram for bins greater than t. The class probabilities and class means can be computed iteratively. This idea yields an effective algorithm.

Algorithm

Step 1: Calculate the histogram and probabilities of each intensity level

Step 2: Set up initial $\omega_i(0)$ and $\mu_i(0)$

Step 3: The possible thresholds t=1 maximum intensity is
1. Update ω_i and μ_i
2. Compute $\sigma_b^2(t)$

Step 4: The threshold maximum $\sigma_b^2(t)$

Step 5: You can compute two maxima (and two corresponding thresholds). $\sigma_{b1}^2(t)$ is the greater max and $\sigma_{b2}^2(t)$ is the greater or equal maximum

Step 6: Desired threshold $\frac{threshold_1 + threshold_2}{2}$

2.7. *Multiple thresholding*

Thresholding is an important technique for image segmentation that tries to identify and extract a target from its background on the basis of the distribution of gray levels or texture in image objects. Multiple thresholding is used where there are two or more classes in an image.

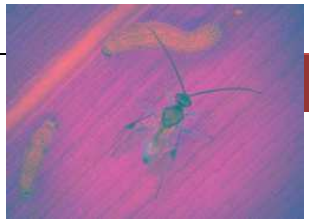
$$\sigma_B^2(k_1, k_2) = P_1(m_1 - m_G)^2 + P_2(m_2 - m_G)^2 + P_3(m_3 - m_2)^2$$

Eq. (6)

3. *Result*

The experiments were carried out in Matlab2010 and the results are as shown





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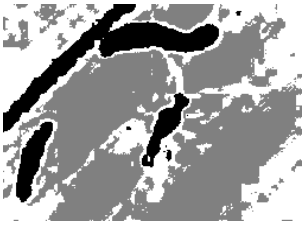
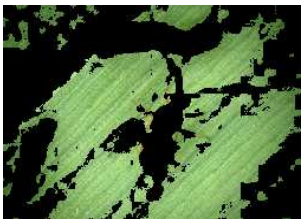
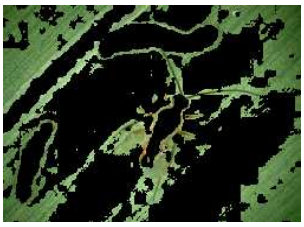
(A) Original Image



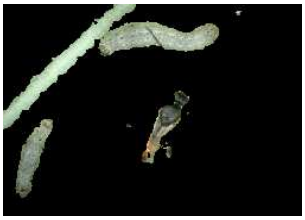
(B) Filtered image



(C) Srgb2LabImage



(D)Image labeled by cluster



(E) Objects in cluster 1

(F) Objects in cluster 2

(G) Objects in cluster 3

(H) Otsu-optimal segment

(I) Multiple Thresholding

4. CONCLUSION

In this paper clustering algorithm is used to identify the insect in the Image. Noise has been removed from the Image Using Median filtering which works well for salt and Pepper Noise. Clustering is being done to identify the color in the Image. K-Means clustering performs well for the clustering of color in the Image. Color separation has shown to find the Objects in the image. Segmentation has also been performed in the image.
This is done perfectly by using the Otsu and Multiple thresholding techniques which are being used to get a better view of the insects which has been performed using segmentation. Using these thresholding techniques the object has been clearly segmented from the image which gives clear information about the object in an image. The output shown in this work highly proves that thresholding provide good segmentation for images.

References

[1] N. Otsu (1979) A Threshold Selection Method from Gray- Level Histograms. IEEE Transactions on Systems, Man, and Cybernetics, vol.9, No.1, pg. 62-66.
[2] FaberV., Mark O. Mundt, Jeffrey S. Saltzman, and James M. White (1994), Clustering and the Continuous k-Means Algorithm,Paradigm Concepts, Inc., Santa Fe, NM. Los AlamosScienceNumber 22, 138-149
[3] L. Spirkovsk. A Summary of Image Segmentation Techniques, Ames research Center, Moffett Field, California, 1993.
[4] Peters Richard Alan. A new algorithm for image noise reduction using mathematical morphology. IEEE—Transactions on Image Processing 1995;4(3):554–68
[5] Darren MacDonald,et al; Evaluation of Colour image segmentation hierarchies, Proceeding of the 3rd anadian Conference on computer and robot vision, IEEE 2006.
[6] Chen T, Ma K-K, Chen LH. Tri-state median filter for image denoising. IEEE—Tran Image Processing 1999;8:1834–8.
[7] K.R. Babu, L.A. Rahul, P.V. Souri and A.Suneetha. Image Denoising in the Presense of High Level Salt and Pepper Noise using Modified Median Filter. IJCST, vol. 2, SP 1, December 2011.
[8] Weszka, J. S. (1978). A survey of threshold selection techniques. Computer Graphics Image Process, 7, 259–265.

E-ISSN: 2321–9637
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International Journal of Research in Advent Technology
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[9] P.D. Sathya, R. Kayalvizhi, "PSO-based Tsallis Thresholding Selection Procedure for Image Segmentation",International Journal of Computer Applications (0975-8887). Vol. 5, No. 4, August 2010.
[10] N. Pal, S. Pal., " A review on image segmentation techniques, Pattern Recognition", Vol. 26. No. 9, 1993, pp 1277-1294.
[11] Y. Lim, S. Lee, On the color image segmentation algorithm based on the thresholding and fuzzy c-means techniques, Pattern Recognition Journal 23 (9) (1990) 935–952
[12] Zhicun Tan, Ruihua Lu, Application of improved genetic K-means clustering algorithm in image segmentation, in: Proceedings of the 1st International Workshop on Education Technology and Computer Science, ETCS 2009.
[13] Rehna Kalam, K. Manikandan, Enhancing K-means algorithm for image segmentation, in: Proceedings of 2011 International Conference on Process Automation, Control and Computing, PACC 2011, 2011
[14] Chonglun Fang, Jinwen Ma, A novelK-means algorithm for clustering analysis, in: Proceedings of the 2009 2nd International Conference on Biomedical Engineering and Informatics, BMEI 2009, 2009.
[15] Haiyan Zhou, Xiaolin Bai, Initial cluster centers to select the K-means clustering method based on graph, Computer Measurement & Control 18 (9), (2010) 2167–2169.