A Study on Image Pre-Processing Techniques for Penaeid Shrimp Image during the detection of Whitespot Syndrome

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Abstract-*The main objective of this study is to develop a system for detection and Classification of white spot Syndrome in Penaeid Shrimp using image segmentation and classification through data mining and neural networks. Preprocessing is first step in identifying the disease of the shrimp and to extract the various features of the image during segmentation and clustering process. The proposed system increases the accuracy of identifying the shrimp disease called white spot syndrome and decreases the recognition time by computer vision technology. In other words the traditional method of the human subjective evaluation method is being replaced by an automated camera and computer based systems. Preprocessing usually contain a series of sequential operations which includes prescribing the image size, noise removal and normalization.*

Keywords-Penaeid Shrimp, whitespot syndrome, Pre-Processing, Noise, Normalization

I. INTRODUCTION

The productivity is something where the economy highly depends. Therefore the detection of the disease in shrimp plays a vital role in aqua industry as shrimp [3] suffering from disease is quite natural. If care is not taken properly in this area then there will be serious effect on shrimp and also results in the quality of product, quantity and also the productivity of shrimp is completed effected. White spot syndrome disease [2] in Penaeus monodon and vennamei is hazardous and should be detected at early stage. Therefore automatic detection of disease must be done. For detecting the disease automatically first image pre-processing must be done. The Image processing is a task of processing the image in removing the noise. There are so many methods to remove noise that exists in the image. The important characteristics of a good noise removal technique is noise should be removed completely by preserving the edges. There are basically two models to remove noise they are linear and nonlinear models. Usually the models used are linear model because of its speed. Noise can be defined as the result of errors in the acquisition of the image where the pixel values do not find to be the intensity of the real scenario. The noise removal is nothing but removing the noise from the image. As there are many methods and techniques are there to remove the noise from the image. The captured image undergoes filtering by various smoothing techniques for the images.

The most occurring types of noise are Gaussian noise, speckle noise and impulse noise. The impulse noise occurs usually by a portion of the image that is completed. It is very difficult to remove multiplicative noise. The main aim of the using image processing techniques [7] is to enhance the quality of the image or to develop the perception of informative images to provide good input. Noise will be there in most of the images due to flash of the camera. It affects the identification of the disease spot. Therefore, image pre-processing techniques [4] have to be applied to remove the unnecessary spots in the image. In this paper a suitable noise removal technique along with normalization is identified which would be much better to find the white spot syndrome of shrimp. The major operations performed on pre-processing of a digital images are image acquisition, noise removal, normalization etc.

II.METERIAL AND METHODS

Image Acquisition

The principal phase of any PC vision framework is said to be the picture procurement arrange. After the image has been acquired, diverse strategies for handling can be connected to the picture to perform distinctive vision assignments required. Be that as it may, if the image has not been gained in a required way then the proposed assignments may not be achievable, even image improvement is finished.

Penaeid Shrimp Images experiencing white spot disorder [8] are gathered from different incubators, water labs and harbors and caught with an advanced camera. In this review SONY 50X Zoom was embraced as a computerized

camera with determination of 672 X 512. More than 20cms separation must be kept up amongst camera and the Shrimp. The picture was shot from the top view. The shrimp images were taken in regular sunshine and in white foundation. The Shrimp pictures of all the two species Penaeus Vennamei, Penaeus Monodon are appeared in Figure.1

Fig. 1: Images Acquired

Image Resize

The resizing of a picture returns picture B that is scale times the span of A. The input picture A can be a grayscale, RGB, or binary picture. In the event that scale is somewhere around 0 and 1.0, B is littler than A. On the off chance that scale is more prominent than 1.0, B is bigger than A. It returns picture B that has the number of lines and columns determined by line number and column number. Either number of lines or number of columns might be NaN, in which case imresize () processes the quantity of lines or columns consequently to save the picture viewpoint proportion. All the Penaeid shrimp pictures are resized to 256 X 256 pixelswhich is not resized and a similar picture after resize is appeared in Figure 2, 3

Various Types of Noise

Noise [6] is the unwanted effect that is being produced in the image during the acquisition of image. With respect to the disturbance type, the image is affected. Therefore what type of noise is there should be identified and different techniques must be used to remove the noise. The various noises are Salt-and-pepper noise, Gaussian noise, Shot noise, uniform noise, isotropic noise, Speckle noise [10].

1) Poisson Noise

Photon noise is the noise that is caused, when photons sensed by the device sensor is not enough to provide the statistical information that is required for detection.

2) Speckle Noise

This noise can be modeled by random value multiplications with pixel values of the image and can be expressed as J = I + n*I where J is speckle noise for input image I and n is the uniform noise image.

Filters

1) Mean filter

Mean filter [1] is nothing but averaging. In this method the filter calculates the average value of image corrupted in a predefined area. Then the intensity value for the

center pixel is replaced by the average value calculated. For all pixel values this process is repeated in the image.

2) Median Filter

Median filter [9] is a non- linear filter, whose response is based on the ranking of pixel values contained in the filter region. For certain types of noise this kind of filter is very popular. The center pixel value is being replaced by the median of the pixel values.

3) Order Statistics Filter

Order-Statistics filters are the type of filters that are non-linear where the response depends on the ordering of pixels encompassed by the filter area. The filter is defined as max filter when the center value of the pixel in the image area is replaced by 100th percentile. It is called as minimum filter if the same value of the pixel is replaced by 0th percentile.

Gaussian Noise and Filtering

The normal noise model is Gaussian noise [5]. This noise model follows the Gaussian distribution. It means that every pixel in the image that is noisy is nothing but the sum of the pixel values that are true and random, Gaussian distributed noise value. The noise is not dependent based on the intensity of pixel values at every point.

The Gaussian random variable is shown as

$Q(x) = 1/ (\sigma\sqrt{2\pi}) * e(x-\mu)^2 / 2\sigma^2 \; -\infty < 0 < \infty$

Q(x) is the Gaussian noise, μ and σ are mean and standard deviation.

Among all filtering techniques [11], in our study we have applied Gaussian filtering technique for penaeid shrimp and implemented in Matlab 2013b and got good results which are shown in Figure 4.

Normalization

In image processing, normalization is a procedure which helps to maintain uniform pixel intensity values. Applications incorporate photos with poor complexity because of glare, for instance. Normalization is now and then called differentiate extending or histogram extending.

Normalization transforms an n-dimensional grayscale image

$$I_N : \{X \subseteq R^n\} \rightarrow \{M,..,N\}$$

with intensity values in the range (M, N).

The linear normalization of a grayscale digital image is performed according to the formula

$$I_N = (I - Min)\frac{Y - X}{Max - Min} + X$$

For instance, if the intensity scope of the picture is 50 to 180 and the wanted range is 0 to 255 the procedure involves subtracting 50 from each of pixel intensity, making the range 0 to 130. At that point every pixel intensity is duplicated by 255/130, making the range 0 to 255.

Normalization may likewise be nonlinear, this happens when there isn't a straight relationshipbetween I and I_N . A case of non-linear normalization is the point at which the normalization takes after a sigmoid capacity, all things considered, the standardized picture is figured by equation

$$I_N = (Y - X)\frac{1}{1 + e^{-\frac{1-\beta}{\alpha}}} + X$$

Where α is width of the input intensity range.

β gives the intensity around which the range is centered.

The results from the noise removal stage makes image ready for normalization which is further used for feature extraction. Initially the algorithm reads the shrimp image in the jpeg format and performs preprocessing to extract the features, normalization is applied.

The results after applying the Normalization for two species of shrimp are as shown in Figure 5.

III. RESULTS AND DISCUSSION

All the above proposed work implemented in MATLAB 2013b software and got excellent results which can be used for further detection and classification of whitespot syndrome of the Penaeid Shrimp image.

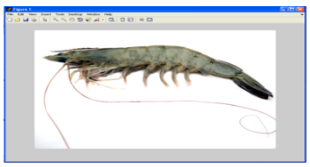

Fig. 2: Image before Resize

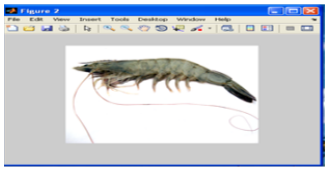

Fig. 3: Image after Resize

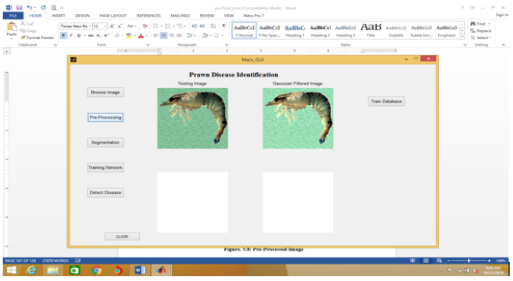

Fig. 4: Gaussian Noise Removal Technique

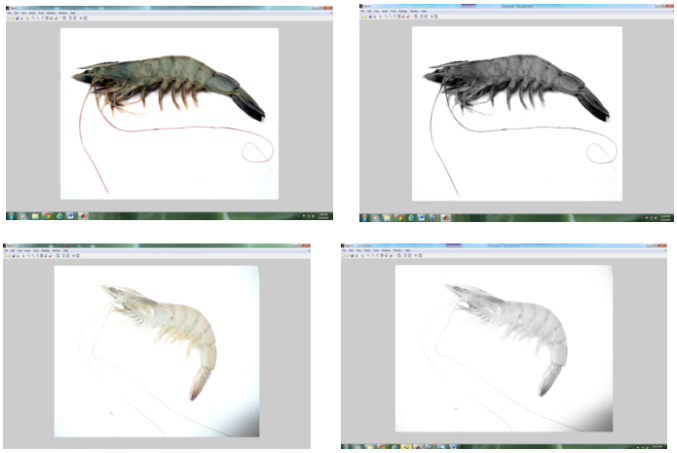

Fig. 5: Normalized images

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IV. CONCLUSIONS

Preprocessing techniques are used on penaeid shrimp images as a first step in shrimp disease detection and classification system. It has presented with contrast enhancement. Therefore, preprocessing techniques used are image resize, noise reduction and normalization for image enhancement successfully done without losing any information from the image. In this study found that Gaussian noise removal technique is most efficient technique to bring the quality in the image which can be used for finding features of the image in next level of detecting the whitespot syndrome and used in Penaeid shrimp classification and detection.

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