

Frame work to Detect White Spots on Shrimp by using Image Processing Techniques

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Abstract

White Spot Syndrome Virus (WSSV), the causative virus of the disease is found in most shrimp farming areas of the coastal areas, where it causes large economic losses to the shrimp farming industry. It will have an effect on the GDP of the country. It is more vital for us to address this problems in aqua culture. To address this issue we are proposing a methodology using morphological operator and transformations techniques in image processing to identify the White Spots found in shrimp tissues. The problematic cartons can be stopped from being exported.

Key words : *White Spot syndrome virus(WSSV), morphological operations, Transformation techniques.*

1. INTRODUCTION:

White spot syndrome virus is a serious disease for shrimp in aqua farming. There are huge variants in Aqua farming due to this disease. Due to late identification of this disease at clinical labs, there is huge loss for aqua farmers and losing their profits. Due to its significance, a design of classifier for the early identification of white spot syndrome with optimal cost and better performance is need of the age. White spot syndrome virus is found in shrimp farming areas in the world which causes economic losses in aqua farming. This type of virus is a hazard for all types of shrimp. White spot syndrome is the main factor leading to the decline of production. Aqua farmers are suffering a lot because of this disease.

This methodology suggests various image processing techniques that will be helpful in the detection of white spot disease in shrimp which is penaeid prawn species.

The methodology in order with first step capturing an image, second step removing noise from the image using image filtering techniques and applies the dilation morphological operation and finally apply transformation technique. The proposed image filtration techniques are laplacian, Gaussian and

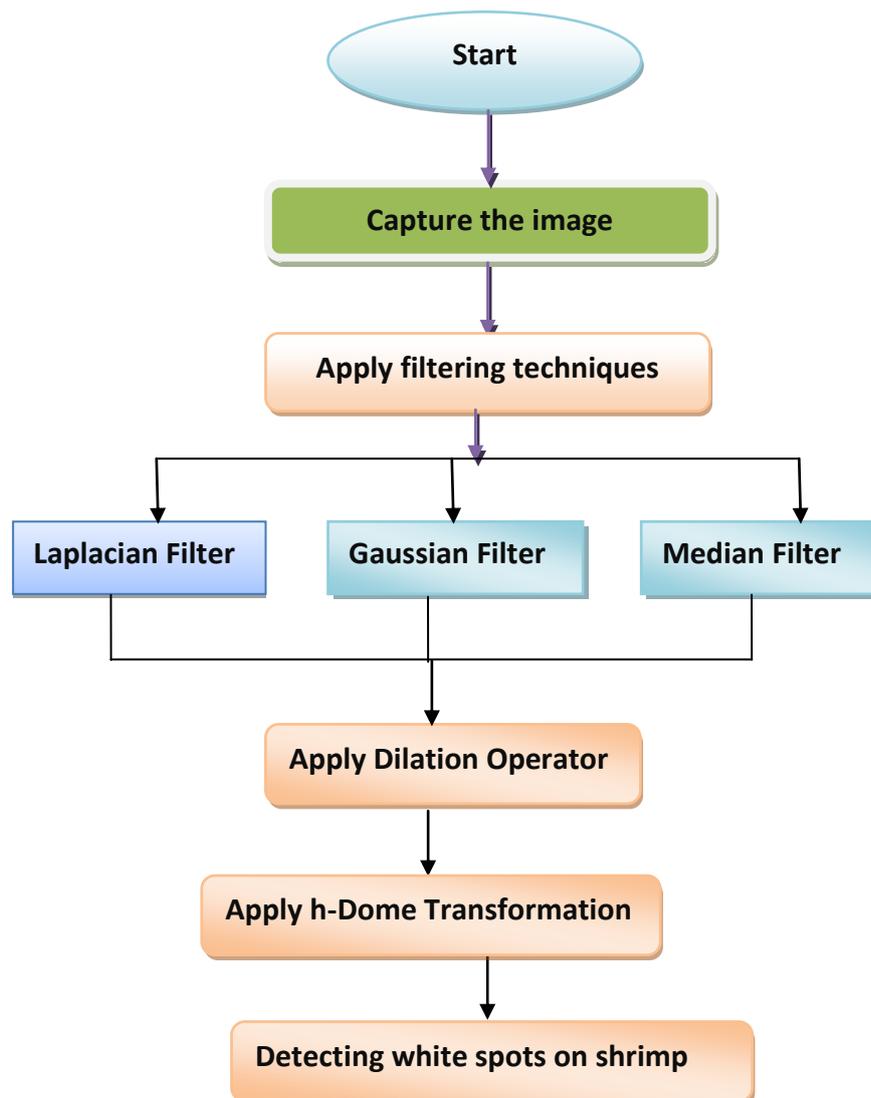
median filtering techniques, apply the dilation operator to identify the span white spot on a shrimp and finally apply the h-Dome transformation h-Dome transformation and reconcile spots detected independently from two wavelength channels. This paper is to provide the best technique among all other image processing techniques to find a solution for white patches syndrome of a shrimp.

2. METHODOLOGY:

To identify white-spots on a shrimp image, the proposed methodology is divided into four steps:

1. Capturing the Image
2. Filtering the Image
3. Apply dilation operator on the Image
4. Apply h-Dome transformation .

The proposed methodology of the process flow is given in Fig. 1



1. Capturing the Image:

To gain the input image, it can be caught utilizing a tiny camera with 10 megapixels of determination to get great quality in the wake of keeping up an equivalent separation, edge and enlightenment to the article with same background. All the pictures are in formats like JPEG, TIF, BMP, PNG etc.,

2. Filtering the Image :

Filtering of the image can be done by converting the image into digitized format and different mathematical operations are used to the data to further process. In images there may some noise due to various factors. This state of the image is called image noise. This noise must be removed before any further image analysis. Gaussian, Median, Linear etc., can be used to remove the image noise. For this paper, some of filters are used to remove noise of an image in order to get the best quality to identify white-patches in the image.

Gaussian Filter:

It is a linear smoothing filter. Here the weights are taken as per the shape of a Gaussian function. This filter is a good performed smoothing filter for removing noise which drawn from a normal distribution. The zero-mean Gaussian function in one dimension is

$$g(x) = e^{-\frac{x^2}{2\sigma^2}}$$

Here Gaussian spread parameter (σ) finds the width of the Gaussian. For image processing, the 2 dimensional zeromean discrete Gaussian function,

$$g[i, j] = e^{-\frac{(i^2+j^2)}{2\sigma^2}}$$

Laplacian Operator:

Laplacian Operator is also a derivative operator which is used to find edges in an image. The major difference between Laplacian and other operators like Prewitt, Sobel, Robinson and Kirsch is that these all are first order derivative masks but Laplacian is a second order derivative mask. In this mask we have two further classifications one is Positive Laplacian Operator and other is Negative Laplacian Operator.

Another difference between Laplacian and other operators is that unlike other operators Laplacian didn't take out edges in any particular direction but it take out edges in following classification.

- Inward Edges
- Outward Edges

How the laplacian works

Laplacian is a derivative operator; its uses highlight gray level discontinuities in an image and try to deemphasize regions with slowly varying gray levels. This operation in result produces such images which have grayish edge lines and other discontinuities on a dark background. This produces inward and outward edges in an image.

Median Filter

In an image, the motivation noise which is called salt and pepper noise can expel through this median filter. It is nonlinear filter, which replaces the estimation of the inside pixel, by the median of the gray levels in the image region encased by the filter. The median of a numerical accumulation is such that a large portion of the qualities in gathering are not exactly or equivalent to medium, and half are more prominent than or equivalent to median [7]. Median filter can be executed as first window is moved and all the pixels encased by the window are sorted. After that median is processed and this worth is assigned to center pixel. On the off chance that the quantity of components in K*K window is odd, middle value is assigned as median value, else average of two middle values is assigned as median value.

3. Apply Dilation Operator:

The DILATE function returns the dilation of Image by the structuring element Structure. This operator is commonly known as "fill", "expand", or "grow." It can be used to fill "holes" of a size equal to or smaller than the structuring element.

Letting $A \oplus B$ represent the dilation of an image A by structuring element B, dilation can be defined as:

$$C = A \oplus B = \bigcup_{b \in B} (A)_b$$

Characteristics of Dilation

Dilation generally increases the sizes of objects, filling in holes and broken areas, and connecting areas that are separated by spaces smaller than the size of the structuring element.

With grayscale images, dilation increases the brightness of objects by taking the neighbourhood maximum when passing the structuring element over the image.

With binary images, dilation connects areas that are separated by spaces smaller than the structuring element and adds pixels to the perimeter of each image object.

3. Apply h-Dome transformation:

To extract the local bright object in biological images, based on mathematical morphology, is the h-dome transformation [3].

h-dome:

$$D_h(f)_{(x,y)} = f_{(x,y)} - \rho_f(f_{(x,y)} - h).$$

where $D_h(f)$ is the h-dome image of a gray-scale image f, $(f-h)$ represents the result of subtracting a constant value h from the gray-scale image, and $\rho_f(f-h)$ the morphological reconstruction of the gray-scale image from f-h. The gray-level reconstruction is obtained by iterative geodesic dilation of f-h under f until stability is reached [4]

The *h*-dome transform is a method for finding the local maxima. It uses a grayscale reconstruction (seed filling) method where the original image is the mask and the seed is derived from the mask by subtracting a constant value *h*. To determine the value of *h*, the foreground regions are first connected using 3D connected components labeling with six-connectedness. Next, the maximum distance transform value of the 3D cell with the smallest volume is found, and the value of *h* is chosen by subtracting a number from this value so as to obtain the biggest seed to reduce the effect of over-segmentation. In our experiments we subtracted two from the maximum distance transform value of the 3D cell containing the smallest volume to obtain the value of *h*. To complete the *h*-dome transform, the seed is then subtracted from the original image, resulting in an image composed of “domes” of the local maxima of the original, none of which can exceed a value *h* in size. These *h*-domes are then used as markers for performing the 3D marker-controlled watershed transform.

h-dome transformation and reconciles spots detected independently from two wavelength channels. *h*-dome transformation and maps spots detected independently from the two channels. Comparing to the conventional processing method, the proposed algorithm considers the entire stack of images as a whole

5. Discussions and conclusion:

The proposed methodology shows how to find the white spots on a shrimp image and to identify how long the shrimp was alive. For this applying the filtering techniques on a shrimp image, while applying filtering techniques the noise was removed and smoothed the shrimp image. And then applying dilation operator the white spots are identified by filling the holes and broken areas and connecting areas in white spots on a shrimp image and by applying *h*-Dome transformation reconciles white spots detected independently from two wavelength channels. And finally this methodology is used to identify the infected shrimp based up on the white spots identification on a shrimp.

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