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An Identification of Penaeid Prawn Species Based on Histogram Values

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Abstract- In Present scenario there is a need for the classification of prawn species with more accuracy. Recognition of an image is a rapid, economic, consistent, objective check and evaluation technique. Researchers had been doing research in this area for so long in the recent years due to deformation, noise, segmentation and obstruction of objects in digital images. Pattern identification can perform many functions in an aquatic processing line: sorting by species, by size, by gender, by visual quality attributes and automated portioning. Histogram of an image is a chart that shows the division of the different intensities in an image . This paper proposes a method of classifying prawn species based on the analysis of the Histogram values. In this work, three different penaeid prawn species include genus Penaeus monodon, Penaeus Indicus and Vannamei. The features of these prawn species are to be compared and to identify to which category it is related. Designing an automatic prawn species recognition system is necessary and most useful as it can perform effective and speedy recognition of prawns.

Keywords- image processing, pattern identification, penaeid prawn, Histogram values, species.

I. Introduction

The prawns of India belong mainly to three major families, namely the Pedaeidae, Palaemonidae and the Sergestidae of decapod groups. A few deep-water forms which are belonging to family Pandalidae are also gaining the business importance with the result of the recent exploratory fishing activities. Prawns are among the most popular types of the seafood. Prawns belong to crustacean family, macrobrachium genus and the suborder dendrobrachiata. The genus Macrobrachium consists of nearly 200 species. They resemble shrimp and also the lobster, with narrow body and the long legs. Prawns are the salt water creatures. There are so many prawn species which are distributed world-wide. Two unusual prawns have got so much importance in aquaculture operations. These are the Penaeus vannamei, and \Penaeus stylirostris. These two species are used throughout the east and west coasts. Penaeus monodon, the giant tiger (or black tiger) Prawn is considered as the world leader in aquaculture domain. Several different types of prawns are found in both the seawater and fresh water and they are also widely farmed in different countries. Freshwater prawn farming is an aquaculture and agriculture business mainly designed to raise and produce freshwater prawns for the consumption of humans as well as decorative intent. The different types of penaeid prawns are Penaeus monodon, Penaeus Indicus and Vannamei. The various species belonging to Penaeus are found both in steamy and moderate latitudes. Practically some of the species are marine and some spend their life in both fresh water and brackish water. Among the twenty eight species of the genus, eight species are represented in Indian waters are P. Japonicus,P.Indicus, P.latisulcatus ,P.canaliculature,P.monodon,P.semisulcatus, P.merguiensis and P.Vannamei. The images of different prawns are different from one another and also from the background. The various features of the prawn which vary physically are rostrum, carapace, adrostral crest, pleoplod, pereopod and antenna etc. For extracting the features of the prawn the information from a prawn is sent to a feature extractor. The classifier examines the features that are passed and takes the decision about the category of the species. The automatic recognition of prawn species by their patterns[2] is a very interesting field. Due to the specific characteristics of prawn species, it is necessary to develop novel image processing techniques.

II. Problem Statement

Prawns are looking same in their appearance to other small, swimming decapods, such as shrimp and boxer shrimp but can be distinguished by gill structure which is branching in prawns. Mainly One exception is the family Luciferidae, which lack gills in adults. Prawns usually have the claws on three pairs of their legs, where as the shrimp have claws on only two. In this situation, Manual sorting of prawns by species is carried out on all commercial basis. The process is very slow. Because of slowness its efficiency is reduced. It also requires increased labour for identifying the various prawn species. All the prawns caught are graded by species. Many Researchers have proposed methods to classify species of aquatic organisms like

fish based on various features[7] [8] [9] [10]. But specifically for prawn species has not been done. Many efforts have been kept to the recognition of digital image but so far still the problem is not yet solved. Recognition and classification as a technique has gained a lot of attention in the years wherever many scientists used these techniques in order to make improvements in the scientific fields. Prawn species recognition and classification is still an active area in the agriculture and aquaculture domain and considered as a possible research in utilizing the current technologies for encouraging and pushing the agriculture and aquaculture researches a head. Although the advancements have been made in areas of developing the real time data collection and on improving the range resolutions, all existing systems are still limited in their ability to detect or classify the prawn based on the external features. The problem of object classification lies at the basic of the task of determining the prevalence of each prawn species. Solution to the automatic classification of the aquatic organisms[3] like prawn should address the following issues as appropriate: a) The size and orientation of the prawn b) Variability of Features: some features like rostrum and carapace may exhibit large differences among different prawn species c) Changes in the Environment: differences in illumination parameters like power and color and the characteristics of water,, such as turbidity, temperature. The environment can be inside or outside d) reduced image quality: image gaining process can be affected by the noise from different sources as well as by the distortions in the optical system e) Segmentation failures: Segmentation may be failed completely due to inborn difficulty. The various prawns with different morphological features and inhabitation, through some look identical[1]. The Morphological features of the prawn are shown in the Figure 1. It is a variety that has to be processed using the image processing before identifying the prawn. There are many species of prawn but in this paper we pertain to three species. We identify these species using Histogram values. Histograms are very useful for image analysis. A histogram is created by counting the number of times a particular intensity value appears in the image[4]. Histograms are calculated by different softwares and also implemented through hardware for real time image processing. Image quality can be made better by the manipulation of histogram.

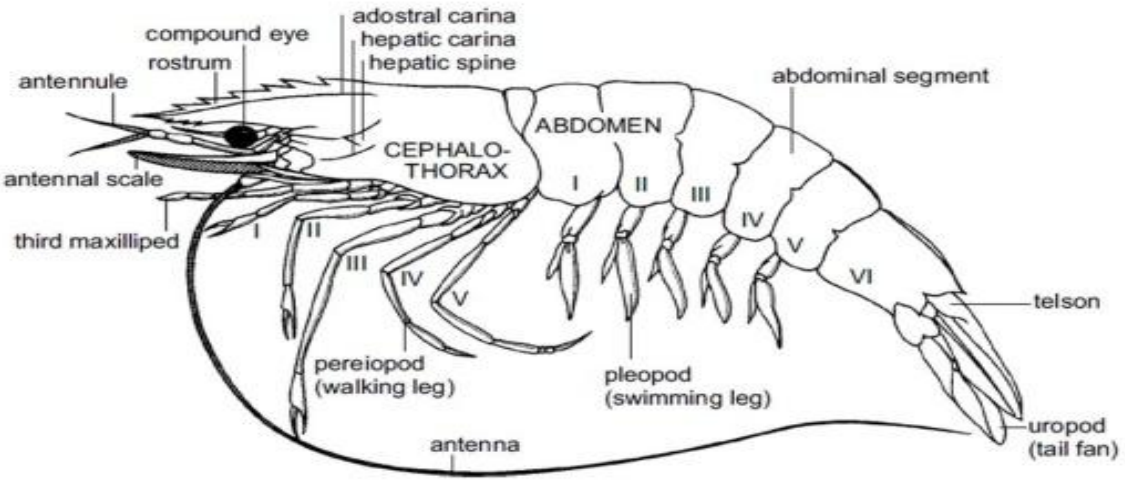

Figure 1. Morphological features of Prawn

In this paper, an approach to characterize prawn species using pattern recognition with Histogram technique is proposed. This study reports the use of Histograms to classify the coastal Andhra Penaeid prawn species. The same technique also can be used to identify other species.

III. METHODOLOGY

A. Proposed method:

1) **Acquisition of an Image:** Using high megapixel camera the images of prawns were taken and was resized as per our need. More than 20cms distance has to be maintained between camera and the Prawn. The image was shot from the top view. The prawn images were taken in natural day light and in white background.

2) **Sample Images:** The samples are taken from few species of prawns namely Penaeus Monodon, Penaeus Indicus, and Vannamei. The sample images are shown in figure 2. Various images have been taken were are RGB. The images are turned to gray level [6] as shown in figure 3. The histograms are generated. Now the histograms are then compared using the test images given by the user. The test image is given by the user to find whether that image is available in the database or

not. If the test image is matched with the existing one in the data base. It gives its name of species, otherwise it displays no such image in the data base.

Figure 2. Sample Penaeid Prawn Images

Figure 3. GrayScale Penaeid Prawn Images

This process is repeated for all the prawn images in the database and the difference in the average value parameter between the test and database image is calculated. The test and database image pair is compared and gives which gives the same values is correctly identified prawn.

3) **Method:** The methodology here gives the identification of prawns based on its intensity values of Histogram. The color images is converted to its grayscale equivalent image and the number of pixels occupying the prawn are calculated. The algorithm is applied to the test image and the data base image and difference is calculated. The test image and database image pair which gives the same value is the correctly identified prawn image. Repeat this process for all the prawn images in the database and calculate the difference between the test and data base image.

4) **Procedure:**

Step 0: start
Step 1: acquire the prawn image
Step 2: convert color image to grayscale
Step 3: count number of pixels in the Prawn
Step 4 : Generate the histogram
Step 5: calculate the difference in Histograms of both the test images and data base image.
Step 6: stop
Step 7: Repeat step0 through step 6 for all database images.

IV. Results And Discussions

The accuracy of the proposed algorithm is tested by various prawn images like Paeneus monodon, paeneus Indicus and Vannamei. All the three species of prawns are kept in the database, following were the results obtained with test image. The entire procedure was implemented and tested using MATLAB7.x [5]. The color image is first converted into gray level image, using matlab function rgb2gray(). The histogram values are calculated for gray level variations using imhist(). According to the histogram values images are extracted from the data base. The Histograms of both the images of monodon and indicus are generated as shown in Figure 4. The Horizontal axis of each histogram plot corresponds to intensity values, n_i, where n_i is the i^{th} intensity value. The vertical axis corresponds to m_k where m_k is the number of pixels in the image with intensity n_k. If the image is dark then the components of the Histogram are concentrated on the low side of the intensity

scale. Similarly Histogram of the light image is biased toward the high side of the scale. By using the Compare function, the comparison of the prawn images of Paeneus monodon, paeneus Indicus is done based on Histograms already generated as shown in Figure 5. As Monodon and Indicus are already available in the database,it identifies the image and gives the result as Paeneus monodon or Paeneus Indicus. If any other species is given as test image it compares with the database and displays the result as unknown image. Compare function returns the root mean square error between two inputs, displays a histogram of the difference and displays an image of scaled difference. Hence having a prawn image, one can program a computer for the automatic identification of the prawn by using histograms.

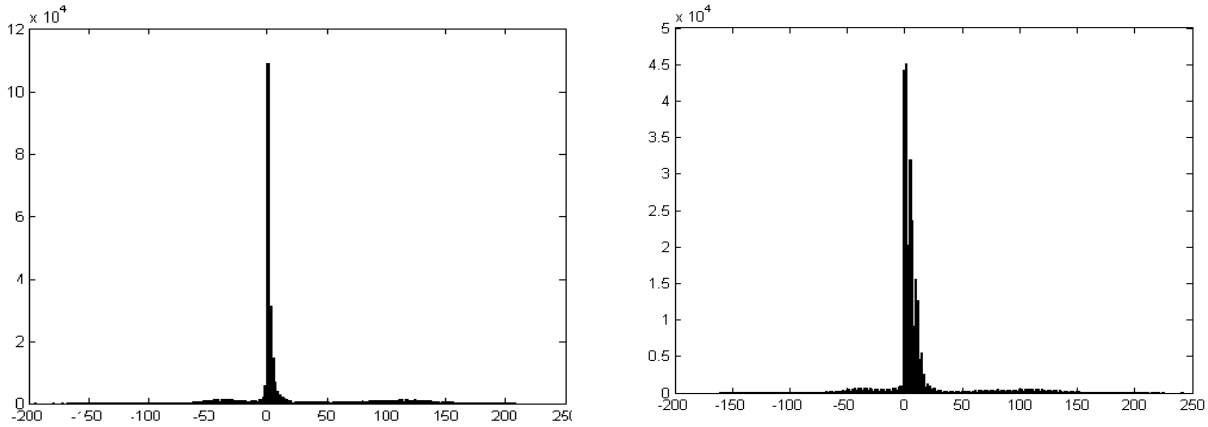

Figure 4. Histograms of paeneus Indicus, paeneus Monodon prawn Images

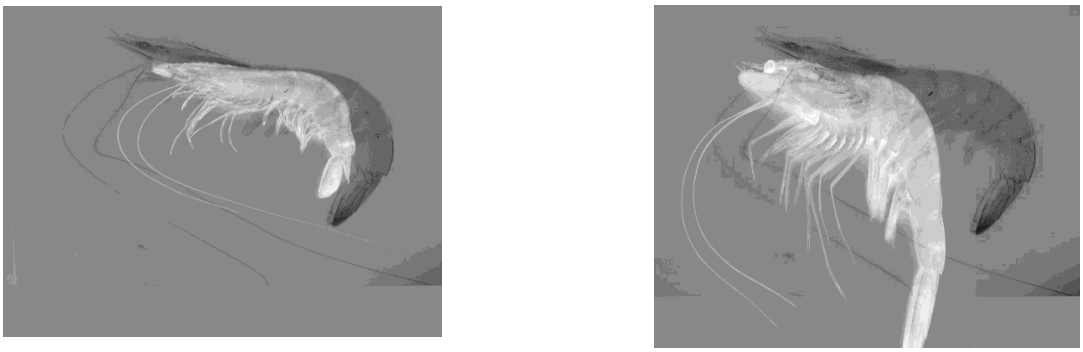

Figure 5. Comparison of Prawn Images

V. Conclusion

In this paper the Prawns are identified based on the Histogram Values. Here the background is clearly maintained as white color in the database images and the test images. Because background maintained is white system achieved better accuracy. By having an image of the prawn programs can be return in a computer for the automatic identification by extracting its features based on histogram values. Therefore, we can implement image processing technique for the identification of Penaeid prawn species with less human errors. The drawback with this method is the prawn characteristics vary broadly from its child stage to the mature stage. Hence this proposed algorithm is restricted for images of prawns of various sizes and if there is any change in brightness also. As a future work we plan to examine the cause for the observations we made in this paper and try to identify the technique for which it does not restrict the size of the image.

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