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Computer Aided Shrimp Disease Diagnosis in Aquaculture

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Abstract-Shrimp aquaculture mainly constitutes major economic processes in the world. Automation of some processes in aquaculture is becoming important. There could be great benefit from automation. Shrimp disease diagnosis is a problem of social and economic interest. This paper presents the latest advancements like the expert system applied for shrimp disease diagnosis and also shows the advances towards the effective tools of diagnosis. It gives the better solution for increasing the degree of automation of shrimp disease diagnosis. This research paper suggests solution that is possible for increasing the automation for the diagnosis of the shrimp disease.
Keywords- Shrimp disease, aquaculture, automation, diagnosis, computer vision

I. INTRODUCTION

The aim of this research paper is to discuss various methods that are possible to increase the automation process by doing analysis about the most recent advancements in the areas of computer vision techniques for aquaculture, experts system used for disease diagnosis and digital image processing techniques. When these three techniques are combined a best diagnosis tool could be obtained. Automation in aquaculture is required as manual doing of things is very costly and requires human labour. The technology challenges differ depending on the type of the problem to be solved. By using some techniques automated disease diagnosis should be done particular for shrimp diseases like white spot syndrome virus. Speed and reliable disease diagnosis must be need if the problem is to be solved properly. The fastness can be achieved by having an expert who is readily available to find and assess the disease and suggest some measures. It is not always to have an expert in remote places which is particularly true in case of shrimp where they are located far from main places. Usually there are three different techniques like remote diagnosis, expert systems and digital image processing techniques. The expert system emulates the ability of the decision making of human expertise[1] which employs a set of rules to perform diagnosis. The advantage of this system is it is cheaper to maintain. Expert systems have been used in the diagnosis of the fish diseases also [2]

II. COMPUTER VISION TECHNIQUES IN AQUACULTURE

Boaz Zion et al [3] developed a method for Real time under water sorting of edible fish species. Some of the fishes namely Common carp, St.Peter's fish and Grey mullet were sorted based on the species when they are swimming in pond water which contains algae, when the fishes are swimming their images were acquired by computer vision system. A relative constant distance from the camera was maintained. The features like size and orientation are extracted by using an algorithm. The classification of these three species of fish like Common carp, grey mullet and St.Peter's fish was achieved with an accuracies of 98.9%, 97.7% and 94.2%.using Bayes's classifier. This system was tested in real time where a pool of fish swim.

arbitz [4] had developed a computer vision technique that is used to estimate automatically the length of carapace of shrimp. The area, weight, length of the carapace and pixel are measured by taking a sample of many shrimps. An accurate calliper was used for measuring the length of carapace as shown in fig 1. For each shrimp the Segmentation was done from its background by using intensity thresholding. A precision of 0.43 mm was yielded by a linear mode. The time spent was less than 0.01s per shrimp by using the image analysis

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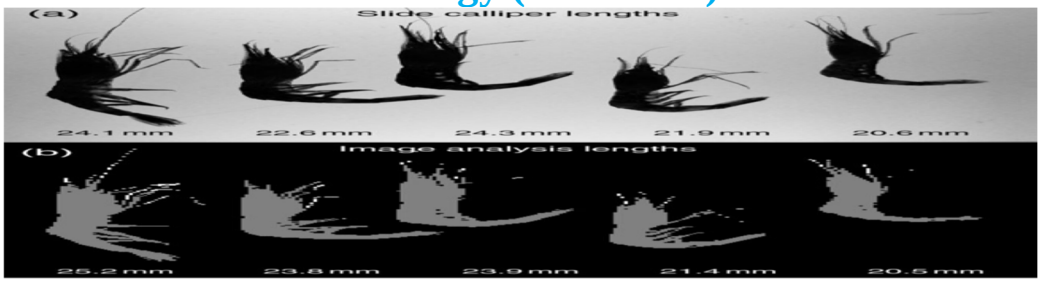


Fig.1: (a) Images of five shrimp (b) Segmented shrimp

Peng-min at el [5] has given a machine vision system for predicting the weight of shelled shrimp. The shrimp with shells is very important for the process of grading. For finding the weight of shelled the Multivariate prediction model was designed in such way that does the feature extraction, morphological operation, and prediction model analysis. All the holes were filled using the erosion operation because there will be holes that are formed after image after segmentation. The model analysis gives us the accuracy of prediction greater than 96.9%. Prediction of shrimp weight by machine vision is more accurate than by grading workers.

Poonpat Poonnoy et al[6] developed the use of image analysis and non-linear regression models for the estimation of sushi shrimp weight. Samples of three hundred sushi shrimps of various sizes were used. Each sample taken was given number and weighted by a digital balance. The sushi shrimp samples were presented to the computer vision system consisting of camera and was connected to frame grabber of computer. The image acquired from frame grabber is then processed and the number of the pixels representing the projected area of the shrimp are counted. Using the computer vision system the rate sorting sushi shrimps was 7200 shrimps per hour.

Mohebbi at el[7] presents a Computer vision technique used to find the shrimp dehydration level based on colour during drying process. The experimental data was obtained from the images captured at various temperatures for drying, several time intervals were analyzed with complete randomized block design and the means were compared with Duncan's multi range test. Linear Regression and the Artificial Neural Networks were applied for correlating the features of colour to moisture content of dried shrimp determined chemically. Based on these two models the results obtained are 0.80 and 0.86 correlation coefficients in linear regression and artificial Neural Networks. Prediction of shrimp dehydration is more expensive with chemical method. The computer vision technique is much better than conventional ones.

Zayde alcicek at el [8] has developed a method to find the colour and visual attributes of tiger shrimp species namely Penaeus monodon using the computer vision. The shrimp images were captured with digital camera. The entire colour information was obtained after the calibration is performed. The results of Image analysis are accurate as shown in fig 2.

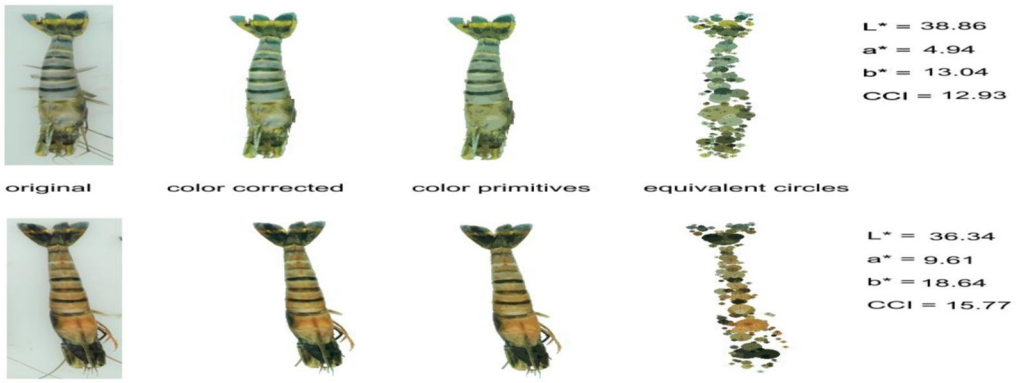


Fig. 2: Original image, colour calibrated image, colour primitives

Luzuriaga at el[9] has given the analysis of quality attributes that are visual for white shrimp by using machine vision. For finding the quality of shrimp the important element is the to find the visual quality attributes by trained experts. As this work is delayed and is difficult. So automation is done for measurement of the quality of the shrimps. This system measured the count, colour, melanosis, uniformity ratio.

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Volker at el[10] has developed a machine vision tool for shrimp aquaculture which mainly used for monitoring the behavior of shrimp, to find the weight of the shrimp and measure its size.Design is done using wide angle cameras. For shrimp segmentation the imaging algorithms have been used.

Balaban at el[11] has given a computer vision technique to find the count and uniformity ratio for the shrimp. For the samples taken are Penaeus Monodon and Penaeus Setiferus. The area of the Shrimp is projected by the camera was used to calculate the weight after calibration.

Dah-Jye-Lee at el[12] analyzes two grading criteria that are used for the finding the shrimp quality based on the occurrence of black spots, which is measured as a percentage of total body surface and quality of Shape showing to whole shrimp as well as broken pieces. The indication of the aging shrimp is based o black spots and are measured to be the defects that must be removed. Shape quality is measured as the size and the completeness of the body. The detection of a black spot is a simple job for a machine vision system for the evaluation of the shrimp quality.

III. SHRIMP DISEASE DIAGNOSIS

With the current advancements of technology the computerization of several activities is done in our daily life. The solution suggested is the use of computer vision techniques. For using these techniques emphasis is to be given for the condition that should meet to make the system useful.

A. Data base

The main drawback for in computer vision methods is lack of suitable database of images. Huge amount of images must be collected from various data sources for the task of building a very good database. The images of shrimp must be collected from ports, labs, harbours, field etc. which are all remote areas. All images of these shrimp suffering from disease must be captured with cameras. Detecting the diseased shrimp is difficult because of water turbidity. Those shrimp must be removed from water for taking images properly. Like that thousands of images are required which is very difficult. Therefore underwater cameras must be required to capture the shrimp images. If the images are not proper then there is no use of automating the system. Therefore the database should have the images of high quality as shown in fig 3.



Fig. 3 Database of shrimp

B. Uncertainty

If the Human expert is not able to diagnose 100% efficiently , then is it possible that a machine could give efficient solution with limited information. Therefore fuzzy logic must be used which deals with uncertainty. Using fuzzy logic the systems will analyze various symptoms' of the disease. Then that information is given as input to the expert system which deletes all the questions having low probabilities of occurrence.

C. Discussions

It is very essential that the degree of automation for providing diagnosis will be very good as it receives good information so that there will be certainty of 100%. Even human experts does the diagnosis only after the careful analysis. The system has to be in such a way that it provides right answers most of the time. Sometimes these things cannot definitive, but they give the precautionary

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measures for shrimp to get isolated from diseased shrimp. It can be finally concluded that to control the disease propagation time is very important that is reason automation is preferred.

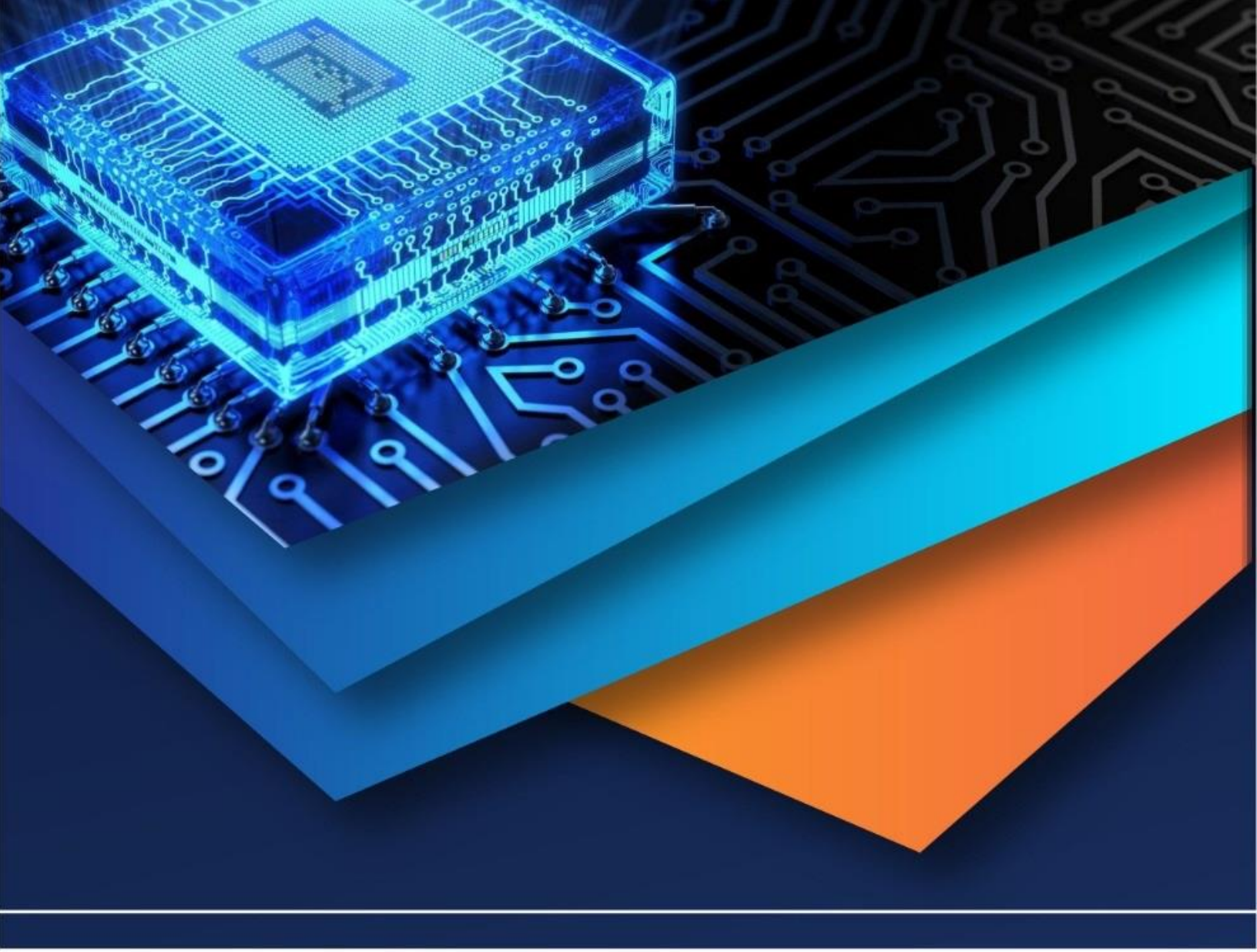
IV. CONCLUSIONS

This research paper gives the birds eye view regarding the use of automation for the shrimp disease diagnosis in aquaculture. To identify and detect the shrimp disease like white spot syndrome the challenges involved are shown as the conditions that are involved in images capture and the methods used in the development are more complex when compared to other areas. That is the reason the use of computer vision techniques for disease diagnosis has come slowly in aquaculture. The level of automation increases by combining various techniques like image processing, computer vision and expert systems. In this paper the pathologists and experts combine together so that the problems can be overcome for the better development of shrimp disease diagnosis tool. Initially white spot syndrome of Peneaus Monodon is considered later it will be applied to other species of the shrimp.

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