Advances in Machine Learning Techniques for Penaeid Shrimp Disease Detection: A Survey

P.Venkateswara Rao, Dr.A.Ramamohan Reddy, Dr.V.Sucharita

***Abstract*— Shrimps are affecting with various diseases. In particular, white spot disease of the shrimp is a very dangerous disease which causes huge loss to Aqua Farmers. This disease affects more into species like penaeus monodon and penaeus Vennammei. There are many Computer vision techniques are there to identify white spot disease of a shrimp. This study helps in finding effective solution through various image processing and neural network techniques to identify the white spot disease of a shrimp which helps aqua farmers in effective decision making to prevent from virus to spread among other ponds thereby increasing shrimp yield.**

***Index Terms*— Shrimp, White spot, Disease detection, image segmentation, Artificial Neural Network.**

I. INTRODUCTION

Shrimp is very important aquaculture species in the world. Usually some of thet viruses affect them, economically. Some of the important shrimp species are Penaeus *monodon*, *Litopenaeus vannamei*and *L. stylirostris*, and others. White spot virus is an exceptionally deadly, infection, which has a place with the family White spot virus. Three WSSV infection disengages were initially identified in 1992 in Thailand, Taiwan and China. Shrimp disease is a difficult issue because of its capacity to spread quickly through water to neighboring aqua farms. Along these areas, fast and exact diagnosis is required to control such diseases. Generally, these diseases will be analyzed by utilizing the collected experience of fisher man or fishery departmental expertise. In any case, the exactness of such last conclusion eventually relies on upon individual skill and experience and the time spent on analysis of every symptom. So as to overcome this problem, automatic detection and recognition of shrimp diseases from digital images. The management of diseases is not an easy task. Mostly these diseases are seen on the surface of the shrimp. They have to be observed visually. So there is more demand for sophisticated images for better understanding. All the tasks can be done manually. But it the tremendous amount of work and also has some drawbacks like more processing time and low throughput. To overcome these issues we need efficient computer software to automatically detect the shrimp disease by extracting features. So this paper provides a survey based on advances in machine learning and image processing techniques used for detection and recognition of diseases in various areas which would be much helpful in detecting the white spot syndrome on peneaid shrimp.

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II. ADVANCES IN MACHINE LEARNING FOR DISEASE DETECTION AND RECOGNITION

A.*Literature Survey*

Dr. J. Abdul Jaleel et al[1] have proposed a system of Artificial Neural Network Based Detection of Skin Cancer. The dermoscopy picture of skin disease is taken and it is subjected to different pre-processing techniques like removal of noise and improvement of image. At that point the image is segmented using Thresholding technique. There are many characteristics that are unique for skin disease areas. Such areas are separated utilizing highlight extraction method by suing- 2D Wavelet Transform technique. These feature values are the input values and are given to the neural network. Back-Propagation Neural (BPN) Network is being used. It arranges the given information set into dangerous or non-carcinogenic.

S. Arivazhagan et al[2] have identified a system for the Detection of unhealthy region of plant leaves and also doing classification of plant leaf diseases based on texture feature extraction. The detection of plant diseases is very essential research because it gives benefits in monitoring large fields of crops, and thus automatically detect the symptoms of diseases as soon as they appear on plant leaves. The proposed framework is a solution for identifying automatically and characterization of plant leaf ailments. The developed framework consists of four important steps, initially a transformation of color structure for the input RGB image that is made, then the green pixels are being masked and evacuated utilizing particular threshold, the texture statistics are calculated for the helpful fragments, at last the separated components are gone through the classifier. The efficiency of the proposed system is in such a way that it can identify effectively and classify the inspected disease with a precision of 94%

Savita.N et al[3] have developed a system for "Detection and Classification of Plant Leaf Diseases Using Image processing Techniques: A Review". This is basically a survey on different classification techniques that can be used for plant leaf disease classification. In this paper the classification technique is used to classify each pattern in one or more classes. Classification is done based on morphological features. It gives an overview of various classification methodologies that is used for plant leaf disease classification.

Vasantha.M et al[4] have proposed an arrangement of Medical picture, extraction, determination and order. Breast Cancer disease is the most well-known kind of cancer found in ladies image. 26 features including histogram force

elements and GLCM elements are removed from mammogram picture. A hybrid approach of feature determination is proposed in this paper which lessens 75% of the features. Choice tree calculations are connected to mammography arrangement by utilizing these diminished elements. Test results have been gotten for an information set of 113 pictures taken from MIAS of various types.

Jayme Garcia Arnal Barbedo et al.[5] presents an overview on strategies that utilization advanced digital image processing techniques to distinguish, measure and characterize plant infections from digital images in the obvious range. In spite of the fact that symptoms can show in any part of the plant, just strategies that investigate noticeable manifestations in leaves and stems were considered. The chose proposition are isolated into three classes as per their goal: identification, seriousness measurement, and grouping. Each of those classes, thus, are subdivided by primary specialized arrangement utilized as a part of the calculation.

Qeethara et al.[6] presents the objective of this paper is to assess artificial neural system in urinary diseases finding. Artificial neural systems are generally utilized as a part of medical issues. Artificial neural systems are utilized to disease finding. Feed forward back propagation neural system is utilized as a classifier to recognize tainted or non-contaminated with two sorts of urinary disease. The results of applying the artificial neural systems technique to conclusion based upon selected symptoms show capacities of the system to take in the examples comparing to manifestations of the individual. The manifestations will go about as the inputs to the neural system. The objectives for the neural system will be related to 1's as infected and will be related to 0's as non-infected. In all cases, the percent effectively characterized in the simulation sample by the feed forward back propagation system is 99 percent. The results show that the proposed diagnosis neural network could be useful for identifying the infected person.

Sannaki et al.[7] presents a paper which proposes a image processing system to address one of the center issues of plant pathology i.e. disease identification and its evaluating. The proposed framework is an effective module that distinguishes different diseases of pomegranate plant furthermore decides the phase in which the disease is. At that point image segmentation is done to get target regions (disease spots). Later, image features, for example, shape, color and texture are extracted for the diseased spots. These resultant features are then given as contribution to disease classifier to properly recognize and grade the disease. At long last, in view of the phase of the disease, the treatment admonitory module can be set up by looking for horticultural specialists, thereby helping the agriculturists.

Munisankar at el.[8] presents one of the most serious problems confronted by the shrimp farming industry is the disease caused by white spot syndrome virus (WSSV). This paper portrays the detection of white spot disorder infection in shrimp (Penaeid prawn) by utilizing K-Means clustering technique as a part of image processing. There are such a variety of techniques for discovering WSSV in water society strategies in that highly delicate capacitive biosensor is one, that uses WSSV shrimp lake water and blends glutathione-S-transferase tag for white spot restricting protein (GST-WBP) was immobilized on a gold terminal through a self-gathered monolayer. Official amongst WSSV and the immobilized GST-WBP was straightforwardly recognized by a capacitance estimation. Under ideal conditions the capacitive bio sensor gives the recognitions in the shrimp species. This procedure is tedious. By utilizing image segmentation strategies we can get precise results and its expense is additionally less and is quick contrasted with different methods.

S.Sapna et al.[9] presents data mining goes for finding learning out of data and showing it in a structure that is effectively compressible to people. Data digging technique is utilized for testing the exactness as a part of anticipating diabetic status. Fuzzy Systems are been utilized for taking care of an extensive variety of issues in various application area and Genetic Algorithm for planning. Fuzzy frameworks permits in presenting the learning and adaptation capacities. Neural Networks are effectively utilized for learning membership capacities. Diabetes happens all through the world, yet Type 2 is more normal in the most developed nations. This paper is proposed on the Levenberg – Marquardt technique which is particularly intended to minimize sum of-square error functions. Levenberg-Marquardt calculation gives the best execution in the expectation of diabetes contrasted with whatever other back propagation technique.

Eman Ebdel et al.[10] presents an efficient image segmentation approach using K-means clustering technique combined with Fuzzy C-means algorithm for medical images. It is followed by thresholding and level set segmentation stages to provide an accurate brain tumor detection. The proposed technique can get benefits of the K-means clustering for image segmentation in the aspects of minimal computation time. In addition, it can get advantages of the Fuzzy C-means in the aspects of accuracy. The performance of the proposed image segmentation approach was evaluated by comparing it with some state of the art segmentation algorithms in case of accuracy, processing time, and performance. The accuracy was evaluated by comparing the results with the ground truth of each processed image. The experimental results clarify the effectiveness of proposed approach to deal with a higher number of segmentation problems via improving the segmentation quality and accuracy in minimal execution time.

Naik Durgesh Manik Rao et al.[11] presents an identification of cotton plant disease. Due to diseases on cotton there may be chances of decrease in production and drastic change is occurred on crop. The fungal diseases like Verticilium Wilt, Bacterial blight, Red spot, Alternaria, Downy Mildew are responsible for production loss. So, this paper presents various types of diseases and control on it using image processing technique. The comparative study of artificial neural network, Support vector machine is discussed.

Md. Amran et al.[12] presents the prospects of automatic image analysis method for image processing, both to provide quantitative information about a lesion, which can be relevance for the clinical, and as a standalone early warning tool. In order to achieve an effective way to identify skin cancer at an early stage without performing any unnecessary skin biopsies, digital images of melanoma skin lesions have been investigated. To achieve this goal, feature extraction is considered as an essential-weapon to analyze an image appropriately. In this paper, different digital images have been analyzed based on unsupervised segmentation techniques. Feature extraction techniques are then applied on these segmented images.

Rakesh et al. [13] proposed weather based prediction models of plant diseases based on support vector machines. The comparison of SVM, ANN and multiple regression were compared. SVM was found to be better method in comparison.

Santanu et al. [14] have describe a system for disease detection in different rice plants. Image segmentation techniques were used to detect the infected parts of the plant. Zooming algorithm is used for the feature extraction. Neural network is used to classify the images of rice have disease.

Di Cui et al.[15] developed a method for quick and accurate detection of plant diseases. Ostu segmentation and K-means clustering is used in this paper. For classification of the diseases that affect on plant leaves back propagation feed forward neural network is used.

Table. 1: Comparison of various Machine Learning Techniques

SNO.	Reference	Application	Features	Technique	Recognition rate
1	J.Abdul Jaleel et al	Detection of skin cancer	Extraction of Colour and texture features using Segmentation	Back Propagation Algorithm	84%
2	S.Arivazhagan et al	Plant leaf disease	Texture features	-	94
3	Savitha.N et al	Classification of plant leaf disease	-	-	-
4	Vasantha.M et al	Classification of plant diseases	-	Back Propagation Algorithm and Hybrid Memetic algorithm with BP classifier	-
5	Jayne Garcia et al	Plant disease	Segmentation	BPNN	N/A
6	Qeethara et al	Urinary disease	Segmentation	BPNN	87.3%
7	Sannaki et al	Pomegranate Plant disease identification and grading	Texture features	SVM	N/A
8	Munisankar et al	Detection of WSSV	Sementation	Kmeans clustering	NA
9	S.Sapna et al	Prediction of diabetes	Segmentation	Fuzzy system and Neural networks	99%
10	Eman Abdel et al	Detection of brain tumour	-	K-means clustering	NA
11	Durgesh et al	Cotton plant disease	Texturefetures	ANN and SVM	98-100%
12	Md.Amran et al	Detection of skin cancer	segmentation	-	-
13	Rakesh et al	Prediction models on plant diseases	segmentation	Support vector machines	89%
14	Santanu et al	Disease detection on rice plants	Image segmentation	SOM neural network	85%
15	Di Cui et al	Disease on plant leaves	Ostu segmentation	Back propagation Neural network	97.2%

As the studies made on the Artificial Neural Networks in various disease recognition systems gave more accurate results. In this paper Artificial Neural Networks are considered as Methodology to develop a system for the detection and recognition of Shrimp disease.

III. CONCLUSION

Disease diagnosis plays an important role. White spot syndrome disease is a disease in shrimp and identification is very difficult. The survey that is being done in this paper gives insight for the detection of different diseases in different domains. It is observed there is more scope in doing research regarding disease detection for penaeid shrimp. Various diseases in different domains have been identified by using machine learning techniques that achieves recognition accuracy along with speed. So there is more scope in working on novel, speed and efficient algorithms that helps in identifying and detecting the white spot syndrome disease in penaied shrimp without the involvement of experts in that field. Also the research can be extended to automatically identifying the severity of the disease detected. It can also be extended for the development of hybrid algorithms to increase the recognition rate in the classification in a better fashion. The authors have showed the path for various future researchers in using Machine learning techniques.

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