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Fish Freshness and Disease Identification Using ANN Algorithm

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ABSTRACT: Identification of Fish species and assessment of fish freshness play important roles in fishery industry applications. This paper describes a method based on Artificial Neural Network (ANN) to improve the performance of fish identification systems and also the disease in the fish. The result is used for the assessment. Identification of the fish freshness and its diseases involve processing of the images of fish. The most efficient features were extracted and combined with the down-sampled version of the images to create a input vector. The applied ANN algorithm has enhanced the reliability of sorting to 96.46%. The realization of camera based image processing system is proposed in order to evaluate the fish freshness and the disease in real-time, is experimented. Intelligent processing of the image patterns involves the use of a dedicated ANN for each species under study. The best estimation of freshness was provided by the most sensitive data's. Data was collected from selected species of fishes over a period of ten days. It was concluded that the performance can be increased using individual trained ANN for each species. The proposed system has been successful in detecting the fish freshness and also the diseases based on the image processing in Matlab software with a better accuracy.

KEYWORDS: Fish, Fisherman, Skin Tissue, Image Processing.

I. INTRODUCTION

Fisheries around the world provide food and income, along with traditional cultural identity. Constituting about 6.3 percentage of the global fish production, the sector contributes to 1.1 percentage of the GDP and 5.15 percentage of the agricultural GDP. The total fish production of 10.07 million metric tons currently has nearly 65 percentage contribution from the inland sector and nearly the same from culture fisheries. Image-based automatic systems: this kind of system explores color and morphological characteristics of an image to infer the disease. This kind of approach tends to be very fast because there is no human interaction. Moreover, such a high degree of autonomy means that a system like this may be used to supervise vast areas without the need for humans to go to the field. Fish disease is dreadful because it spreads overnight through water to neighboring aqua-farms. Therefore, high speed diagnosis is required. This paper explains a new method for detecting the freshness of the fish sample provided as input. Actually this method overcomes the problem of less accuracy and favors faster detection than manual methods.

II. LITERATURE SURVEY

1) *A Novel Idea for Freshness Analysis and Classification of ICED Seafish*

Fish is a source of food for many species including human. It has been an important source of protein and other nutrients for human. Fresh fish are always better for preparing healthy and tasty food. Analysis of fresh fish is an important aspect to get the best quality of the fish for the preparation of healthy food. Sensory evaluation method is usually practiced in fish industry which involves judging of freshness by smell, color, appearance, taste and texture. The validity of this evaluation method has been questioned due to general parameters. In this project we are developing an evaluation method by using image processing of fish eye. The fish eye image will be captured on different days and it is analyzed by using image processing tools to evaluate its freshness. The analysis will give the freshness index and the classification of fish species considered in this study. In the initial stage of the project, 2 species of fresh fish will be procured and images will be captured. Fish is stored by using chilling process and images are captured on different

days for further processing. Later the captured images are processed by using image processing techniques and stored in the database. An android application is developed to capture/choose the test image and upload it to compare with the images in the database. Result will be freshness index of iced sea fish as per its days. If a series of fish images different days is uploaded, the classification will be done and the result is presented in the excel sheet.

2) *Image Processing Based Method For Identification Of Fish Freshness Using Skin Tissue*

The quality of the fish is mainly altered by different cooling methods, exporting, handling etc. In this paper a nondestructive framework is proposed for identification of fish freshness using image processing techniques. In this paper skin tissue is selected as focal tissue for basic analysis and identification of freshness of fish from fish images. Statistical features are extracted in the HSV color space which gives degradation pattern for fish freshness which is used to design the framework for identification of fish freshness. The experiment result indicates monotonic degradation pattern. Experiments were carried on fish images and results are encouraging. The maximum classification accuracy of contributed methodology is 96.66%.

3) *Image Processing Technique To Detect Fish Disease*

Disease is one of the major cause for fish mortality. The identification of diseased fishes are at early stage to prevent and spreading diseases. Manually detecting fish diseases are not error free. The image of the diseased fish recognize by using PCA method. In this work diseased area segmentation of fish image based on color features with K-means clustering. HSV images and Morphological operation open for better accuracy to diseased area detection and measurement. Taken four Epizootic Ulcerative Syndrome (EUS) diseased fish images as a case study to evaluated the proposed approach. The experimental results clear indication of the effectiveness of proposed approach to improve the diseased identification with greater precision as well as correctly compute diseased area. The simulation results of this approach are encouraging.

4) *A Review on the Techniques for Quality Assurance of Fish and Fish Products*

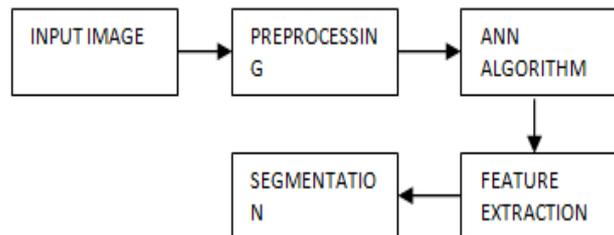
The safety of fish and fishery products has been looked at great importance as it can affect the consumer's wellbeing and FAO standards. Due to high demand of fresh fishes and fishery products, fish industries have been working more extensively on developing methods to evaluate the quality of fish. It is also critical to understand the changes occur in the fish, that causes them to lose its quality. A method to evaluate freshness and microbial quality of fish has been carried out since ancient times and is still under research globally. This review article summarizes the current methods that are used most to assure fish quality and the parameters they measure. The paper also contrasts the ancient methods, with respect to developing nations like Bangladesh, and the challenges they face in implementing new techniques available.

5) *Development of Methodologies for Fish Freshness Assessment using Metabonomics Application*

Assessment of seafood is based upon freshness and taste. Both are essential and vital to the seafood sector and to consumers, but freshness is the most important and often the most difficult to measure. The quality of seafood relies on a series of parameters regarding: safety, nutritional values, availability, freshness and edibility. There are a number of factors influencing these such as: handling, processing and storage from when the seafood is caught to the consumers' table. Physical, chemical, biochemical and microbiological changes occur post-mortem in fish; and they result in a progressive loss of taste and quality which include changes in protein and lipid fractions, the formation of biogenic amines and hypoxanthine and microbiological spoilage. Key factors essential to seafood quality are both the time and the temperature of storage. In fact, for the most part, fish spoilage depends upon the temperature that controls to a greater extent the bacterial and the autolytic breakdown. There are also other factors that can influence the rate of spoilage: such as the fish species, the sanitary conditions on board when caught, the amount of food in the fish guts and the origin of seafood (wild or farmed). At present, no single instrumental method is reliable for the assessment of seafood freshness and spoilage. Thus, the European Community establishes the principles to control and to certify the quality warranty in seafood through sensory, chemical and microbiological analyses. (EU Regulation No. 2406/96). The aim of this PhD thesis is to verify the possibility of using HR 1H-NMR and chemo metrics methods as an analytical instrumental method to detect all of the parameters in the assessment of fish freshness. Combining NMR with chemo metrics indicates all of the metabolic consequences of the specific conditions on seafood (e.g., modifications due to storage temperatures, giving an overview of the evolution of freshness in time.)

III. PROPOSED SYSTEM

BLOCK DIAGRAM



1. Preprocessing

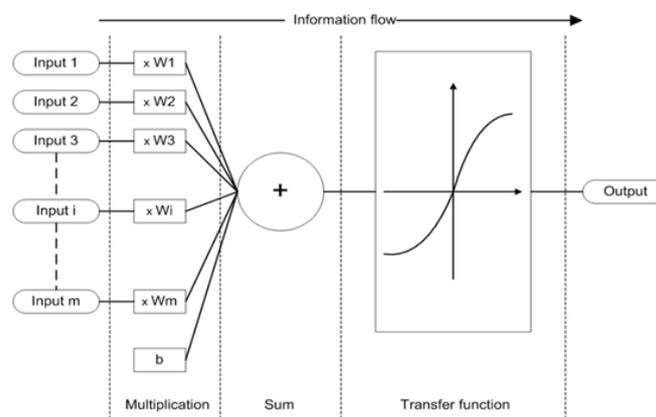
Image pre-processing can increase the reliability of an optical inspection. Several filter operations which reduce certain image details enable an easier or faster evaluation. Here, preprocessing is done using Reshaping and Gaussian filtering process. Image Resizing or image interpolation occurs when we resize or alter our image from one pixel grid to another. Image resizing is necessary when we need to increase or decrease the total number of pixels, whereas remapping can occur when we are correcting for lens distortion or rotating an image.

2. Image Segmentation

Image segmentation is the process of partitioning an image into number of regions. This division into regions is based on the characteristics of the pixels in the image. For example, one way to find these regions in an image is to look for abrupt discontinuities in pixel values, which indicates the edges. These edges can define regions. Other methods divide the image into regions based on color values or texture.

3. Artificial Neural Network

An Artificial Neural Network is a mathematical model that tries to simulate the structure of biological neural networks. Artificial neural network building blocks has artificial neuron. This model has three simple sets of rules: multiplication, summation and activation. At the entrance of artificial neuron the inputs are weighted such that every input value is multiplied with individual weight. The middle section of artificial neuron sums all weighted inputs and bias. At the exit of artificial neuron the sum of previously weighted inputs and bias is passing through the transfer function.



4. Matlab

MATLAB is a proprietary programming language developed by Math Works. MATLAB allows manipulating the matrix pixels, plotting of functions and data, implementation of algorithms, user interfaces creation and interfacing with programs. Although MATLAB is primarily intended for numerical computing, an optional toolbox which allows



access to symbolic computing abilities uses the MuPAD symbolic engine. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for embedded systems.

IV. CONCLUSION

In this work, we consider the prospect of using digital image processing methodology to detect and diagnose fish diseases and its freshness by determining the infected areas on fish body. To do this, we proposed an image processing based fish disease diagnosis system which helps earlier treatment of infected fish to prevent the spread of disease. The system is composed of extracting affected area from the image and making final diagnosis from results of clustering. By applying the series of image processing techniques, we can computerize the procedure of fish disease diagnosis. Experimental results show that the proposed system is more convenient, consistent, and rapid in the diagnosis fish disease rather than general diagnosis method by fish veterinarians.

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