A Novel Idea for Freshness Analysis and Classification of Iced Sea Fish

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Abstract: *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 study we are developing an evaluation method by using image processing of the 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 classification of fish species used in this study. A series of fish images of different days is uploaded, the classification will be done and the result is presented in the excel sheet.*

Keywords: *Fish Eye, image processing, Freshness index, classification, excel sheet.*

I. Introduction

Evaluation of Fish quality and development of simple yet reliable methodologies are the goal and scope of research in fishing industry. In finding a measuring tool for fishing industry the attention should be given to make it simple and easy to handle with accurate results. There are significant development has been done particularly through chemical analysis but still there is a scope with advancement in technology.

The classification of fish on the basis of its freshness into different grades is also an important aspect in the fishing industry. As fishes are exported to different countries, the fresh fishes have more demand. Providing the fresh fish to customer also indicates a better trade practice and creates a good brand. In this regard the fish industries have to classify the fishes into different grades so that they can provide the best quality of fish to the customers.

In this study we use image processing tools to analyze the freshness of the sea fish. The analysis will be done on 2 species of fish. Initially the eye image of the fish is captured on different days and kept in the database. The images are segmented and its features are extracted. Classification of the image is done and a database is created as per the image captured on different days. KNN Algorithm is used for the classification. When a series of fish images are given as an input to the modeled device, it will crops its eye part, extracts the features and compares with the database. Fishes are classified into different grades and results are stored in the excel sheet to identify their grades.

II. Proposed System

The Proposed system consists of two stages. Stage one is to capture the images for creating database and in stage two a series of test images are given for classification based on database. In this system two species of fish, King Fish and Makrel are used for the freshness analysis. The images of two fish are captured and stored in day one. The process is repeated in day two, day three with the same setup. The required images are stored in the database. The eye part is extracted by image segmentation process and its features are obtained and stored in database. If a series of fish images of different days is given as the input for the model it will compare with the database and classify them according to their grades and the results are stored in the excel sheet. The block diagram of the proposed system is as shown below in Fig 1.

2.1 Fish Procurement and Storage

The fresh fish has been procured from the market and stored for analysis. The storage box with ice is used for storing the fish for longer time. Chilling is done to prolong the shelf life of the fish. Chilling can slower the action of bacteria and enzymes and physical and chemical processes that can in turn affect the quality of the fish. Fresh fish is highly perishable and gets spoiled very rapidly at normal temperatures. The spoilage rate can be reduced by reducing the temperature below the normal temperature.

2.2 Image Capturing for creation of database

The initial set up is to create a database of iced fish by capturing the image on different days. Two species, King Fish and Makrel with 10 samples of each are used for the process. Ice pieces have been changed every day for better refrigeration. Capturing of image is carried out at particular time with certain experimental set up for the better quality of the image.

Steps in capturing the image

- Image is captured by using minimum 8 mega pixel camera
- Image has to be captured in a closed room with equal amount of light exposure everyday
- Image background is white for all captured images
- The height at which the image is captured is 20 cm

On day one the fish is procured from the market and image has been captured immediately. At this stage the fish was not iced and it's a freshly caught fish. Below Fig 2 is the captured image King fish of day one and Fig 3 is the captured image of Makrel of day one. After capturing the image the fish is kept in ice for further process. On day two iced fish is procured and image has been captured with same experimental set up. After the process of day two the ice has been changed and fish is kept in refrigeration for chilling process. Below Fig 4 is the captured image King Fish of day two and Fig 5 is the captured image of Makrel of day two. On day three iced fish is procured and image has been captured with same experimental set up. Below Fig 6 is the captured image King fish of day three and Fig 7 is the captured image of Makrel of day three.

2.3 Image segmentation

For the captured image, segmentation is performed so that it becomes easy to analyze the image. The steps involved in the segmentation process are as fallows.

- Initially image is resized to required size [400 512] pixel.
- The resized image is cropped to obtain the required area- the eye of the fish.
- The cropped image is median filtered to reduce the noise.

Fig 8 is the copped input image of King Fish of 3 days and Fig 9 is the cropped input image of Makrel of 3 days. Fig 10 is the median filtered image of King fish of 3 days and Fig 11 is the median filtered image of Makrel of 3 days which has reduced certain noises in the image.

2.4 Feature extraction

In the below Fig 12 and Fig 13 the input image of King fish and Makrel is converted into YCBCR format. YCbCr and Y′CbCr are two different type of practical approximation of color processing. Here the basic color corresponding to green, red and blue are processed to obtain the meaningful information.

2.5 Database

Database is a collection of data in the particular format stored for further processing. After feature extraction the values are stored in the database. Further the features of the captured image on day one, day two, day 3 is extracted separately and stored in database as samples. These processed samples can be further used for classification.

2.6 Classification

Classification of input images is done on the basis of extracted features. According the values obtained from features we classify the image. We use K-nearest neighbor's algorithm to classify the object into different grades. k- Nearest Neighbors algorithm (or K-NN algorithm) is a non parametric method used in pattern recognition for classification and regression is applied in this study. In both classification and regression inputs consists of the k closest training examples in the feature space.

The values obtained after feature extraction will be stored in the form of .mat file. Classification of sample images is done by using both k-means algorithm for clustering and k-NN algorithm for classification.

Initially 10 samples of King Fish and Makrel are procured and used for the analysis. The images are captured on different days, segmented and features are extracted. Here k-means clustering algorithm is used to cluster the image into 3 parts. By using this algorithm the input image used as a training sample which is divided into 3 clusters. Later the k-NN algorithm is used for classification. The k-NN algorithm will find its nearest neighbors having similar pixel values and forms a class. After applying k-NN classification for all the 3 clusters, a set of values are defined for different images.

2.7 Final detection

Final detection in this study classifies the freshness of fish according to its day. A series of images can be given as an input with different days. The images are processed and classified using the matlab and the result

is displayed in the excel sheet showing the number of fishes of different days. In the fallowing process 6 images of different days are given as the input for classification. Classification result is shown below in Fig 14.

III. Figures
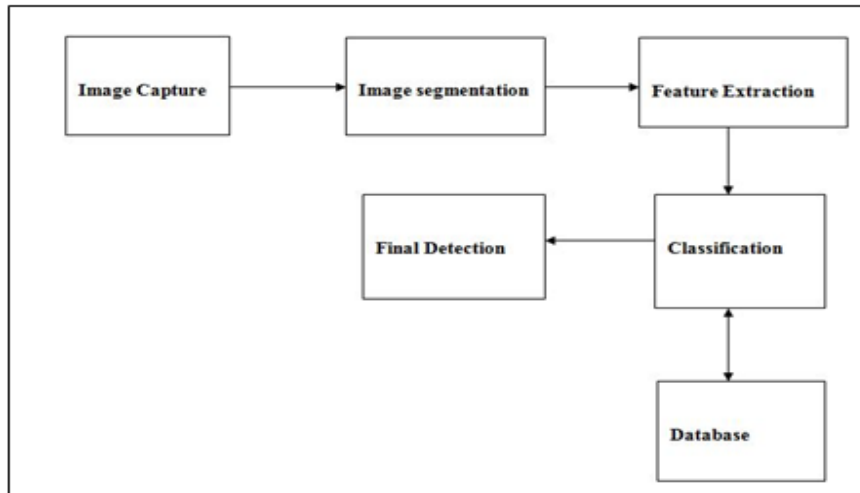
Figure 1. Block diagram of proposed system

Figure 2 King fish Day one

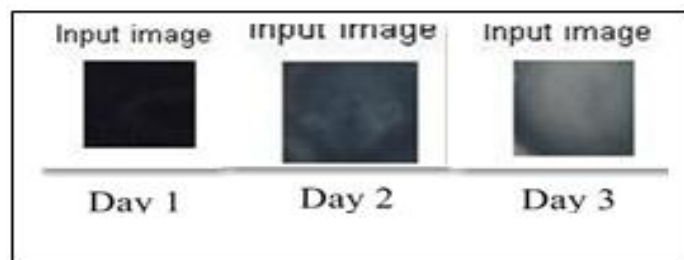**Figure 3** Makrel Day one

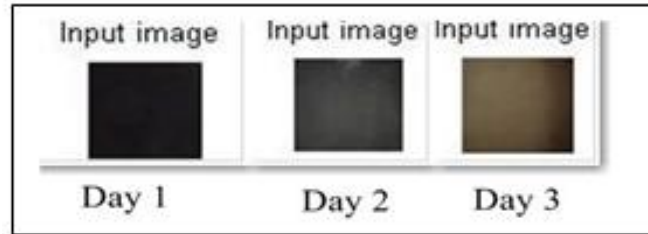**Figure 4.** King fish Day two

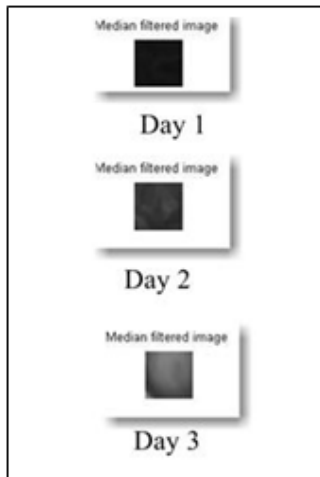**Figure 5.** Makrel Day two

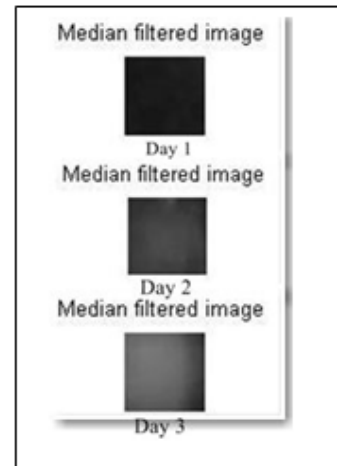**Figure 6.** King fish Day three

Figure 7 Makrel Day three

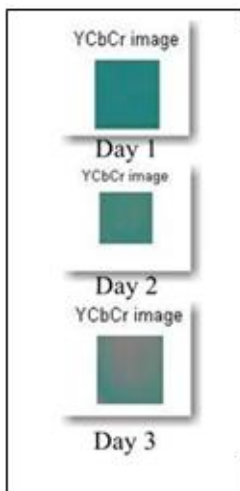**Figure 8** Cropped input images of King Fish of 3 days

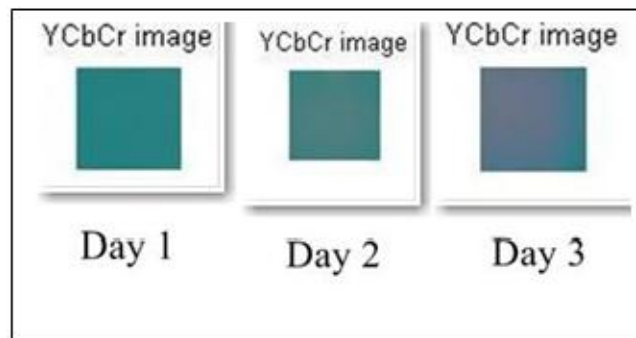**Figure 9** Cropped input images of Makrel Fish of 3 days

Figure 10 Median filtered image of King Fish of 3 days **Figure 11** Median filtered image of Makrel of 3 days

Figure 12 YCBCR images of King Fish of 3 days **Figure 13** YCBCR image of Makrel of 3 days

Figure 14 Snapshot of classification of Fish in Excel Sheet

IV. Conclusion

The study has developed a methodology for classification of the fishes on different days. A series of images of fishes on different days are given as the input. The images are compared with the images in the database and they are classified according to their days. The classified images are stored in the excel sheet for easy segregation of fishes of different days. Here classification of images depends on the range of values stored in the database. Capturing the image according to the process mentioned in the study gives a better result.

The classification of set of images helps the user to segregate the fish with respect to its grade depending on their days. This makes better segregation of quality fishes and also helps to have a count of fishes with different grades. When it comes to implementation part the model can be implemented in the fisheries where they can identify the different grades of fish.

In future model can be extended to more number of species of fishes. New technology can be implemented to capture the better quality images with simpler procedures. Model can provide accurate results by having better algorithms and techniques in coming days. Model can also be implemented in industries by having hardware and mechanical model to segregate the fish of different days.

Acknowledgment

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