

Aquamarine learning system for fish recognition

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Abstract: This approach is characterized as classifying a number of images into different categories, where each category is composed of images that have similar content in terms of high-level concepts, rather than relying on human-input meta data such as captions or keywords. The present proposed study is an attempt to develop an automated system for image classifications. The proposed system will have fast and robust retrieval algorithm for contour images. This technique is expected to be an invariant to translation, rotation and scale change and noise corruption; moreover it will be a simple and thus suitable for large database.

Keywords: Knowledge base (KB), Texture, Feature Extraction, Co-occurrence matrix.

Introduction

This work process images of different types of fish samples, extracting the features of the fish samples and developing a suitable knowledge based classifier model to classify and recognize the different types of fish images using three different types of feature sets, viz., color, texture and shape. The Content Based Image Retrieval system developed uses visual content to search images from large-scale image database according to users interest, retrieving similar images from the database, when an image is given as a query [1][9]. Machine vision seems a suitable technique to automate this task, since numerous image-processing algorithms are available for extracting classification features from fish images[2]. Automatic classification is based on knowledge of fish size, shape, color and texture. The most common features used in practice are the measures derived from the spatial gray tone co-occurrence matrix, which are called Haralick features, namely seven features are Contrast, Energy, Local homogeneity, Maximum probability, Entropy, Cluster shade & Cluster prominence, Co-occurrence matrix is frequently used in this classification method. These texture features are the function of distance & angle for the prediction of the angular dependent features are not used instead their average are used, which are invariant to rotations[3][4].

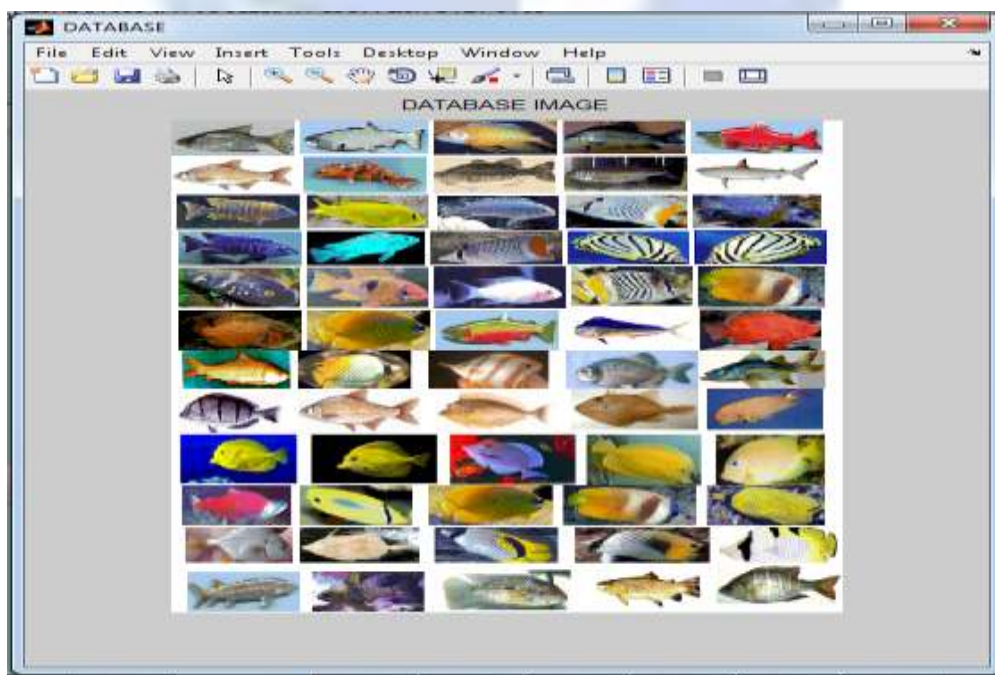


Fig. 1 Snapshot of Fishes database

Training the System

From all the training images, color and texture features are extracted and stored in separate databases[5]. The developed system is trained with fish from eight different classes namely, Lancdet, Lamporey, Electriceel, Piranha, Bowfin, Trout, Angle Fish and Cardinal fish. The combined color and textural features are also stored in a separate database. The color features are given to color model along with expected output and its actual output is checked. If the actual output is not equal to expected output within the specified required MSE is not reached, then the training parameters are adjusted and the process is repeated until the knowledge base is trained properly[6]. This procedure is repeated for all the input training images. To validate the proposed approach the systems implemented on MATLAB tool and been tested for various image captured the experimental steps is considerably 2 different family in which each family we consider 2 or 3 fish images and all these are stored in database as closed images.

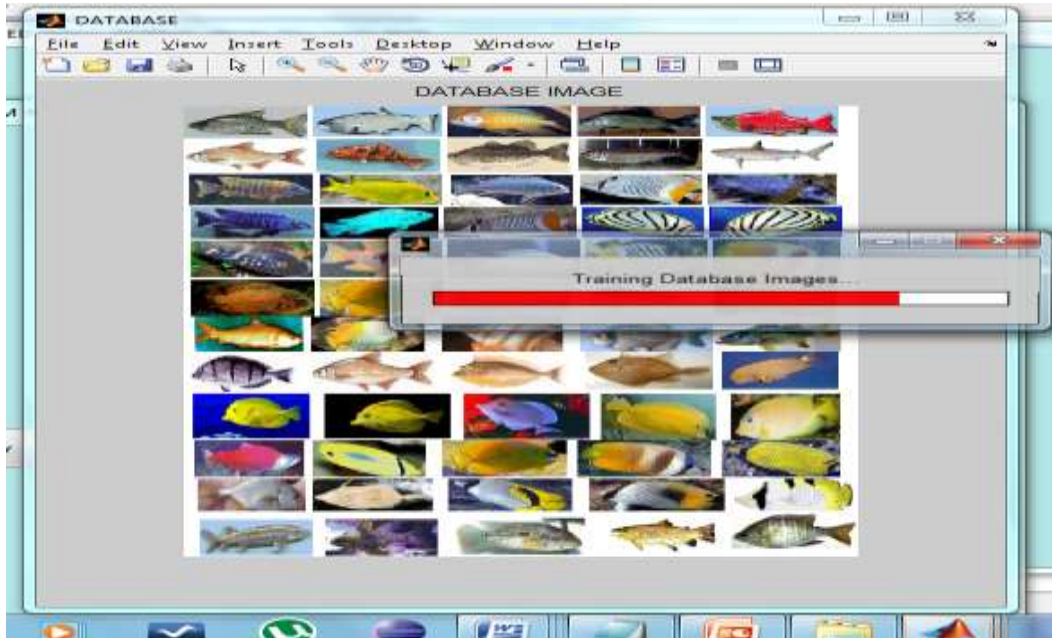


Fig: 2 Snapshot Training the system

Testing the system

In this phase, the fish from untrained set of samples are used to test the knowledge base classifier for classification of fish. From the test image, color and texture features are extracted and stored in separate files. The color features are given to color model and its output is checked. Similarly, texture and combined features are given to texture and combined models respectively and their outputs are tested.

Testing the system

Input: Test sample of image + knowledge base.

Output: Classified fish image, the recognized fish image with percentage of accuracy.

Begin:

Step1: Input test sample image of fish.

Step2: Construct co-occurrence matrix.

Step3: Compute feature Vectors.(Contrast, Energy, Local homogeneity, Maximum probability, Entropy, Cluster shade, Cluster prominence)

Step4: Compute the average feature values of testing sample.

Step5: Compare the average range feature values of test sample with the values stored in the knowledge base.

Step6: If the values are matched approximately then the test sample is classified as one of the trained sample.

Step7: Comparing classified images to its query image we get recognize image with graph showing percentage of matching.

End

Feature Extraction

In order to recognize image, the image has to be segmented and the shape of the image has to be extracted [7]. On to the extracted shape, feature is computed. The steps for feature computation are as given below:

Segmentation

Segmentation is the process of separating objects from the image back ground and it subdivides an image into its constitute parts or objects. The level to which this sub division is carried depends on the problem being solved that is and segmentation should stop when the edge of the fish image is able to detected i.e. the main interest is to isolate the fish image from its background [8].



Fig. 4.1: Illustration of fish image segmentation from the background



Fig. 4.2: Samples showing extracted shape of fish images

Color Based Feature Extraction

The important color models used in color image processing are RGB (Red, Green, and Blue).

Color Image Processing

- a) In automated image analysis, color is a powerful descriptor that often simplifies object identification and extraction from a scene [10].
- b) In image analysis performed by human beings, the motivation for color is that the human eye can discern thousands of color shades and intensities, compared to about only two dozen shades of gray.

RGB Color Model

The original 24-bit color images used in this study are of size $M*N*3$ where M and N are the height and width of image respectively and 3 indicates the three 8-bit color components of the original images, viz. Red(R), Green (G), and Blue (B). From the original images, RGB components are separated the components RGB are of size $M*N$.

Average Fish Color

In this technique, the background color and the actual fish color are separated. The color of the fish is usually not being uniform. Hence, the average of the pixel values of fish is chosen as fish color, the following algorithm followed to extract the color of the fish is given as under.

Algorithm: Average Fish Color

In order to extract the color of the fish image we are using below algorithm. Which separate back ground colors and actual fish color and input is given as fish image and output we are getting as an average color of the fish image [11].

Input: Fish Image.

Output: The average color of the fish image

Begin

1. Each row of the fish image is scanned from left to right and the pixel value is read.
2. If the pixel value is non-white, the value is inserted in to array and the array size is increased.
3. Step 2 is repeated for all the rows.
4. The average of the array elements is computed and output as the average fish color.

END

Methodology for the Proposed System

In this approach a database is created. This database consists of 40 images of fish of various classes. Once an image of a fish given to the query, the query read and compare with database. This comparison is done on the based on two important methods i.e. Global Based Method and Local Based Method. Using Global method shape and color parameter are found and by using local based method different parameters such as Contrast, Energy, Local Homogeneity, Cluster Shade, Cluster Prominence, Entropy and Maximum Probability of the image is found out. The other important parameter that is calculated at local based method is texture based feature extraction with different angle [12]. Using all the above tools we finally find the class of given fish and also find the probability of finding the exact fish from the database.

The image queries can be characterized into three levels of abstraction:

- a). Primitive features such as color or shape,
- b). Logical features such as the identity of objects shown, and
- c). Abstract attributes such as the significance of the scenes depicted.

The commonly used features are: Contrast(C), Energy (E), Local Homogeneity (LH), Maximum Probability (MP), and Entropy (EN), Cluster Shade (CS) and Cluster Prominence (CP), which can be used for training in the database. The obtained trained feature is compared with the test sample feature obtained and classified as one of the extracted features.

Conclusion

In this paper we have tried to shown how the visual properties of a pixel vary with changes. The result of this analysis generated a set of resultant images for a query image for content-based classification of images. This paper show that modern machine learning architectures can classify images using exactly the same 'input' as was available to human classifiers using color, shape and textural features This paper developed an automated learning for aquamarine fish database for the learning, recognition and classification of fish image.

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