



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 Issue: III Month of publication: March 2018

DOI: <http://doi.org/10.22214/ijraset.2018.3532>

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Fish Recognition and Classification Based on Feature Vector Analysis

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Abstract: To recognise the fish varieties; to the subsequent processing and marketing, the necessary thing is to classify the types of fish. This study is based on image processing technology with the help of python window (open cv module). Nowadays people can hardly differentiate between same categories of fish. Highly mercury levelled fish are sold in the market. To save people from this situation our objective is to classify the fish species. This can be performed in several situations. Five feature vectors are used here to make difference among fish, Size and Shape Measurements, area of tail is calculated to get the accurate classification of fish species.

Keywords: Fish Recognition and Classification, Canny, Contour, Pixel, Edges, Opencv.

I. INTRODUCTION

We know that the earth supports numerous objects, many of which are unidentified [7]. What if, any object is given to our hand which we may not know, but with available technology we can get to know what the object is, in our hand itself [8]. Nothing can be more beneficial than this to us. Our focus is to get to this extent.

Here, we have considered the specific issue i.e. 'Fish' [9]. We know that the world has enough of this species and so this marks a great interest in Research work for scientists. There are many fishes of which we are unknown. To the ones we have heard, we may not be familiar of. Hence through this project we are trying to identify a particular fish (considering that we do not know it from before). We are using Digital Image processing technique to get to our goal [6].

Four fishes are taken into consideration, namely, Hilsa – Ilish Shad, Rohu – Labeo Rohita, Catla – Indian Carp and Pomfret – Bramidae, As we know that, money is a big factor for any purpose, so in this project we are not utilising any additional high definition camera modules; those can obviously be used, but we strongly believe that, it is the utility of any purpose to each and every individual that makes it a great success. High definition camera modules may serve the purpose but will not reach to everyone to make it fruitful. Hence we have considered the laptop 'webcam'. The fish is brought near to the webcam for analysis. Its image is captured, then analysed through various algorithms [3][4][5][6], and finally we get its name. We have considered **five feature vectors** for each fish as our stored data, which include Length, Width, Ratio of Length and Width, Area of Tail and Length of Wrist of Fish and prepared algorithms to identify any fish and propose its name if its characteristics matches with the one present in our library. The image of the fish is taken for analysing all its feature vectors, compared with all the ones present with us, then ultimately given us the name of the fish (if it matches). Entire programming is done on python window.

II. RELATED WORK

There are different researchers from all over the world works on the recognition of fish and its Species. Some of the researches are on Fish Recognition based on Robust features extraction from color texture measurements using Back-Propagation classifier [1]. Where they Recognised fish based on Robust features extraction and also with colour texture measurements which gave better result. Another Researches are like Shape- Based Fish Recognition Using Neural Network [2]. They also Recognised fish using Neural Network and Back-Propagation. They focused on Size Measurements, Shape and Texture Measurements, Color Signatures and Geometrical Parameters. As above there are many researches on Fish recognition based on different ideas to recognise and analyse the species of fish.

III. PROPOSED WORK

The Proposed work is mainly focused on identification of species of Fish by getting some feature vectors.

A. Identification of Fish

This module focuses on different features of fish which are Length of fish, Width of fish, Ratio of Length and Width, Area of Tail and the length of wrist. The steps are as follows: -

- 1) *Image Acquisition:* Fish of different species are taken and kept on white table for getting white background in non-overlapping condition and captured by 13-megapixel camera. The training databases are created with five pictures of each species. Fig 1. Shows the sample captured images.



Fig 1. Sample captured Images

- 2) *Pre-processing and Image Enhancement:* In this stage images are firstly get Resized in 500*240 Pixels and then gets converted in Canny image from Blue-Green-Red (BGR) images. Resized Canny Images are shown in Fig 2.

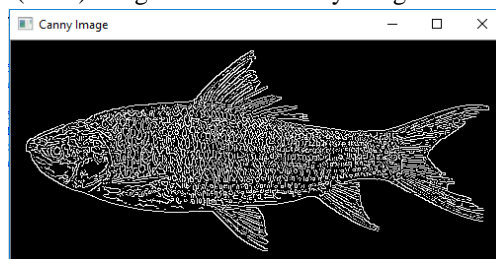


Fig 2. Canny Image.

- 3) *Edges Detection:* In this stage we focus on detection of different edges in canny image shown in Fig 2. There we used canny edges detection algorithm for getting different edges for getting length and width of fish. We took only starting, ending, top and bottom edges of fish and pointed with a big dark circle for clear vision.

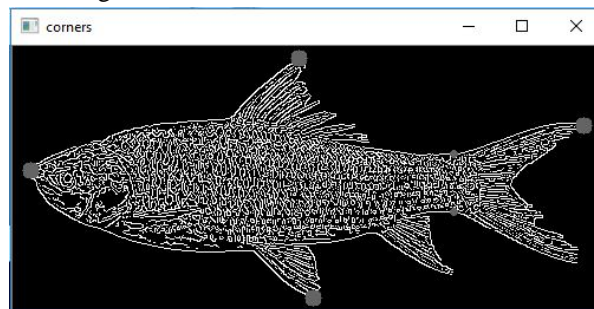


Fig 3. Edges detection

- 4) *Features Extraction:* In this process we get five different features, they are: -
 - a) *Length of fish:* - Different fish have different length. So we took this as one the feature.
 - b) *Width of Fish:* - Different fish have different width. So, we took it as another feature.
 - c) *Ratio of Length and width of fish:* - Some fish may have their length same and width different and some may have width same and length different. So, for analysing difference between both we calculated Ratio of Length and Width. By calculation we got a unique value of both the fish.
 - d) *Area of Tail:* - We took this as another feature vector of fish because area of tail varies much fish to fish. All species of fish have their own area of tail.
 - e) *Length of Wrist:* - We took this as another feature vector of fish because length of wrist of fish differ most from one species of fish to another.

By getting all above five feature vector we get better result in classifying species of fish. Because length may be same, width may be same, length and width both may be same, length of wrist may be same and area of tail may be same of one fish with another one but all above five features never be same of one species of fish to another species. So for that we easily identified the species of fish.

5) *Preparing the Training Database:* So, after getting all feature vector we trained database with many fishes.



Fig 4. Representation of Trained Data Set

Table I

S. no.	Name of Fish	Length	Width	Ratio of L/W	Length of Wrist	Area of Tail
1	Hilsa – Ilish Shad	474.081	205.429	2.308	47	2090
2		495.525	230.106	2.153	45	1887
3		499.985	214.009	2.336	42	2028
4		425.978	156.013	2.73	41	1566
5		464.389	204.846	2.267	46	1577
6	Rohu – Labeo Rohita	469.54	203.354	2.309	49	2192
7		467.547	153.688	3.042	53	2107
8		491.015	170.988	2.872	53	2110
9		469.881	203.482	2.309	50	2152
10	Catla – Indian Carp	491.015	170.988	2.872	52	2174
11		492.915	178.474	2.762	58	1189
12		494.972	179.234	2.762	69	1037
13		438.858	160.854	2.728	67	1456
14		435.362	164.685	2.644	69	1445
15	Pomfret - Bramidae	492.915	178.474	2.762	62	1258
16		477.074	205.448	2.322	27	691
17		417.634	201.435	2.073	30	952
18		418.466	197.041	2.124	30	980
19		409.708	188.282	2.176	34	815
20		418.466	197.041	2.124	29	798

Fig 5. Trained Data Table

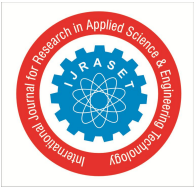
IV. CONCLUSION

This proposed work is not only gives the length and area of the fish but also conclude with it's specific name. That specific name of fish can be helped a person to identify the fish. People will be more aware at the time of buying fish. The result shows that our proposed system works with 99.97 percent efficiency. It can be used in various field of our environment.

This idea of automation system can also be implemented on biological cases ; i.e : to identify the micro images like blood cells to examine whether it is a normal cell or leucamea. Through image processing technology nowadays we can easily recognise the features of objects and this idea of automation to recognise fish through coding is one of them; by developing it's data library this system can be more effective in future.

V. ACKNOWLEDGMENT

This research was supported by Department of Computer Science & Engineering, Brainware Group of Institutions, Kolkata and we are thankful to them and also We are thankful to our colleagues Mr. Ritwick Dey, Prithwee Das and Joydeep Maiti who provided possible support to successfully complete this research. We are also grateful to our Departmental teachers for assistance with a technique, and colleague Miss Sweta Kumari who moderated this paper and in that line improved the manuscript significantly. We have to express our appreciation to all above persons and Institution for sharing their pearls of wisdom with us during the course of



this research. We are immensely grateful to all above mentioned person and Institution, although any errors are our own and should not tarnish the reputations of these esteemed professionals.

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