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A Study on Underwater Image Processing for Classification of Species Using Contour

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ABSTRACT: Studies on marine ecosystems are important for analysing the health of coastal environments. Many works are in progress to maintain the marine ecosystem and to find higher concentration of marine species. In this paper classification of species is done based on size and contour, and the species are classified as big or small according to their size. This paper uses underwater image processing in which studies on five different species of fish is carried out using contour.

KEYWORDS: Underwater image processing, contour, marine ecosystems etc.

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I.INTRODUCTION

To study and analyse the target species present in underwater images is a challenging field since it is difficult to detect and segment objects in underwater environment because light cannot penetrate deeper in water. In recent years there has been a rapid increase in underwater object detection and its classification. This work is motivated by the importance of underwater object detection and its classification to study marine species, underwater marine structures, underwater surveillance systems etc. Several underwater object detection and classification systems have been designed successfully. All these methods have their own advantages and disadvantages, and none of them works equally well for all kinds of images. Many object classification methods are available and cannot be completely relied on for precise object classification.

Different features for partitioning the image on the basics of size, colour, shape, brightness and texture can be used. In this paper we are using size based classification method.

II.PREVIOUS & PRESENT WORKS

Traditionally, fish recognition is processed using ordinary fish features such as weight, length and width. The fishes were either dead fishes, in conveyors or kept in constraint environments such as ponds, tanks etc. Marine biologists also dive to observe underwater environment, using photography as introduced by [Caley et al., 1996.Traditionally, marine biologists identify fish from their ichthyological characteristics such as meristics and morphometrics, scale morphology, parasites, cytogenetics etc([Begg and Waldman, 1999]).

Fig [1] Dead Fish

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Fig [2] Fish in Tank

Fig[3] Fish Conveyor

Present Scenario is fish recognition as a combination of many properties in different parts of the fish such as tail, head, top and bottom in unconstraint environment.[Spampinato et al., 2010] proposed an automatic system to help marine biologists understand fish behaviour by classifying fish species. Automatic fish recognition systems are beneficial to underwater fish research. Firstly, the authors used a moving average algorithm and Adaptive Gaussian Mixture Models with Adaptive Mean Shift for tracking.Secondly, they combined two types of features for fish classification: Texture Features and Shape Features. The system is tested on a database containing 360 images of ten different species. The database contains 14 streaming images and 18 affine transformation images for each species. The result achieves accuracy of about 92%.

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Fig[4] Fish in different backgrounds

III. PROPOSED METHOD

The algorithm is to test whether the fish image is of a small fish or of a big fish. The algorithm was applied to a system of 5 different fish types: Bodianus mesothorax, Chromis viridis, Dascyllus albisella, Dascyllus aruanus, Dascyllus reticulatus. For each fish we used 10 images. Therefore a dataset of 50 images were used for training purpose and 20 images are used for testing purpose. After testing different images taken randomly an accuracy of 100% is obtained.

IV. SIZE BASED CLASSIFICATION

For classification based on size initially in the acquired image is converted to grayscale after which edge detection is performed then morphological processing was done in which dilation of the gray image is done after which filling of holes is performed and thus a contour of the acquired image was obtained . Next step was finding the compliment which is an optional step, after dilation the holes were filled to complete the contour. Thus a completed contour is obtained. Now the number of pixels were counted and area of the obtained contour was calculated if the count was found to be above the threshold value in our case taken as 24000 it is assumed that fish is big and if it is less than 24000 the fish is classified as small.

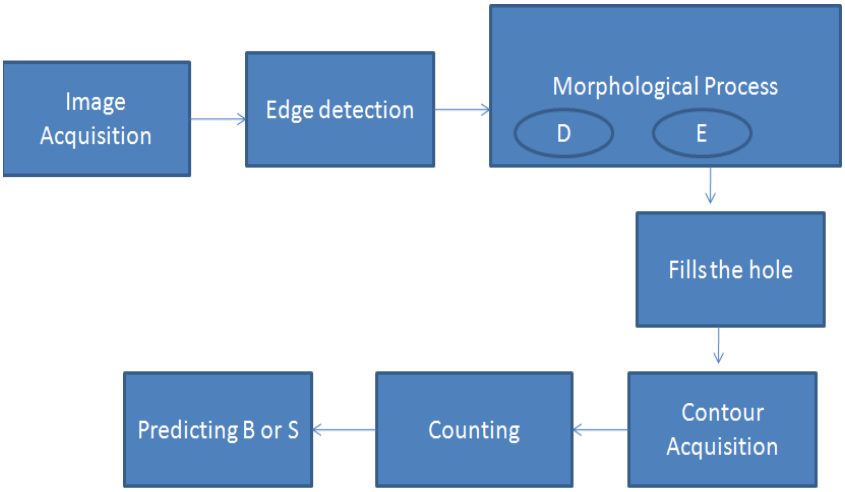

Fig. 5 Block diagram for size based classification

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Different steps involved in size based classification of fish species and the corresponding output figure obtained for each step by using the algorithm developed is shown in the figures below:

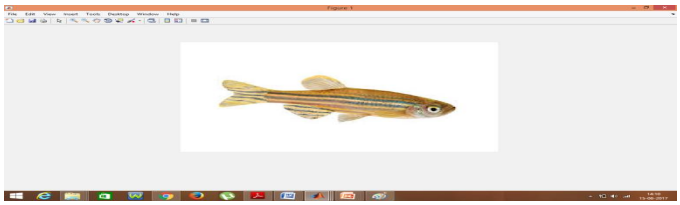

Fig 6(a)

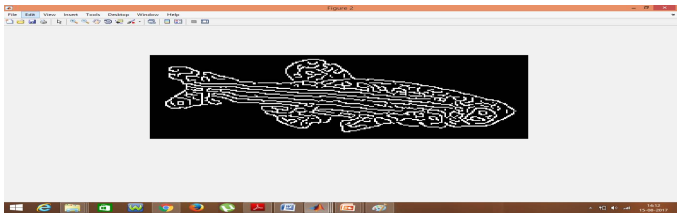

Fig 6(b)

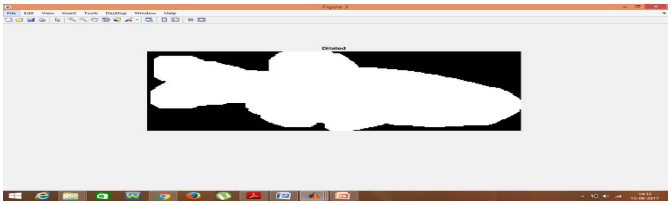

Fig 6(c)

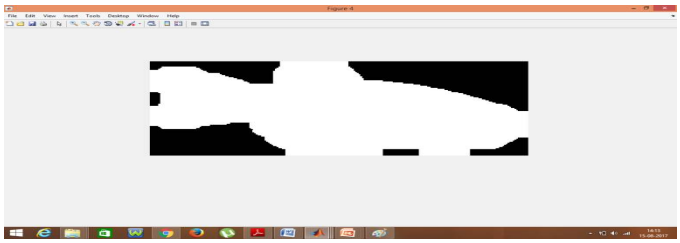

Fig 6(d)

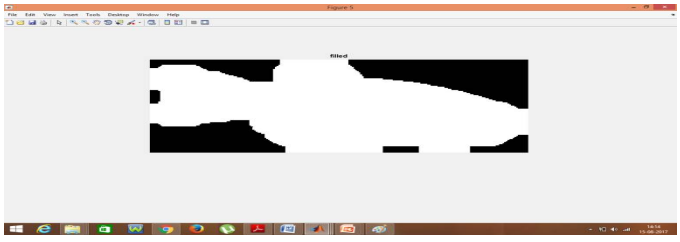

Fig 6(e)

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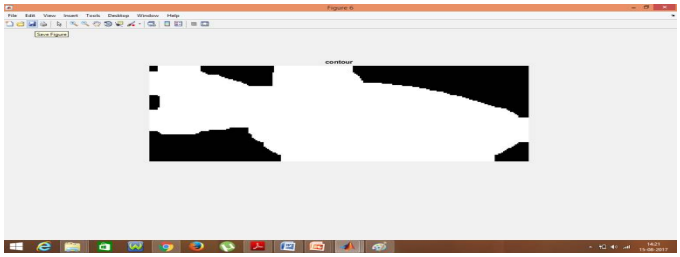

Fig 6(f)

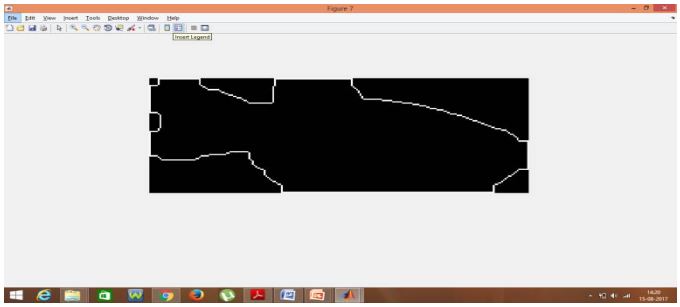

Fig 6(g)

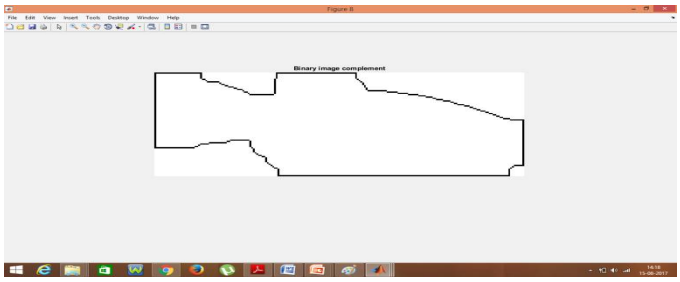

Fig 6(h)

Fig.6(a) Original image; 6(b)Grayscale image; 6(c) Dilated image; 6(d)Morphologically processed image; 6(e)Filled image;6(f) Contour of image; 6(g)Extracted boundary; 6(h)Binary compliment to count area.

V. CONCLUSION

Most of the research based on species classification in marine ecosystem is done in very few and limited foreign countries. Hence usage of size based classification technique, resulting in the possibility to classify different underwater species will be beneficial for fisherman and researchers. Out of 20 test images taken we have obtained an accuracy of 100%. In future we are going to classify the species based on its texture features.

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