Underwater Image Segmentation Using Clustering

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***Abstract*- Quality of underwater images is directly affected by water medium, atmosphere medium, pressure and temperature. This emphasizes the necessity of image segmentation, which divides an image into parts that have strong correlations with objects to reflect the actual information collected from the real world. Image segmentations the most practical approach among virtually all automated image recognition systems. Experimental results show that fuzzy c means clustering algorithm performs better than other methods in processing underwater images.**

***Index Terms*—Clustering**

I. INTRODUCTION

A **cluster** is a small group of something .Here in segmentation it is group of pixels ,which has same value based on color, intensity or texture .There are 2 types of clustering available:1)Exclusive clustering 2)Overlapping clustering. In 1st clustering data point belong to exactly one cluster, But in 2nd clustering data point may belong to two or more clusters .Example of exclusive cluster is k-means clustering and overlapping clusterinf is fuzzy c means. For segmentation Input image is converted into feature space. The clustering task differentiate the data into number of partitions, which are volumes in the n-dimensional feature space. These partitions define a hard limit between the different groups and depend on the functions used to model the data distribution Clustering is the search for distinct groups in the feature space

II. NEED OF IMAGE SEGMENTATION

The use of image segmentation is to cluster pixels into main image regions. **Image segmentation** is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images.Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

Fig 1 Image Segmentation based on region growing technique

III. TECHNIQUE OF IMAGE SEGMENTATION

1. Adaptive thresolding method
2. Watershed method

3. Region growing by active contour method
4. Fuzzy C means clustering

Description:

1. ***Adaptive thresolding method*** - Thresholding is called adaptive Thresholding when different thresholds are used for different regions in the image. This may also be known as local or dynamic Thresholding
2. ***Watershed segmentation method*** - In image watershed segmentation, altitude is represented by the gray level of the pixels. All pixels throughout the same catchment basin are connected with the minimum altitude region of the basin. The watershed lines divide individual catchment basins. The high gradient regions correspond to watershed lines and low gradient regions correspond to catchment basins.
3. ***Region growing by active contour method*** - Region-based active contour method is to find the image partition that minimizes a criterion including both region-based and boundary-based terms. Each region is described by a function named "descriptor" of the region. First, for a given application like detection of moving objects, various descriptors can be easily tested inside the same theoretical framework. Second, this framework can be applied to other applications.
4. ***Fuzzy C means clustering*** - In K means clustering, data is divided into distinct clusters, where each data element belongs to exactly one cluster. In fuzzy clustering (also referred to as soft clustering), data elements can belong to more than one cluster, and associated with each element is a set of membership levels. These indicate the strength of the association between that data element and a particular cluster. Fuzzy clustering is a process of assigning these membership levels, and then using them to assign data elements to one or more clusters. The FCM algorithm attempts to partition a finite collection of n elements X = {x1,...,xn} into a collection of c fuzzy clusters with respect to some given criterion

IV. FUZZY C MEANS CLUSTERING IMPLEMENTATION

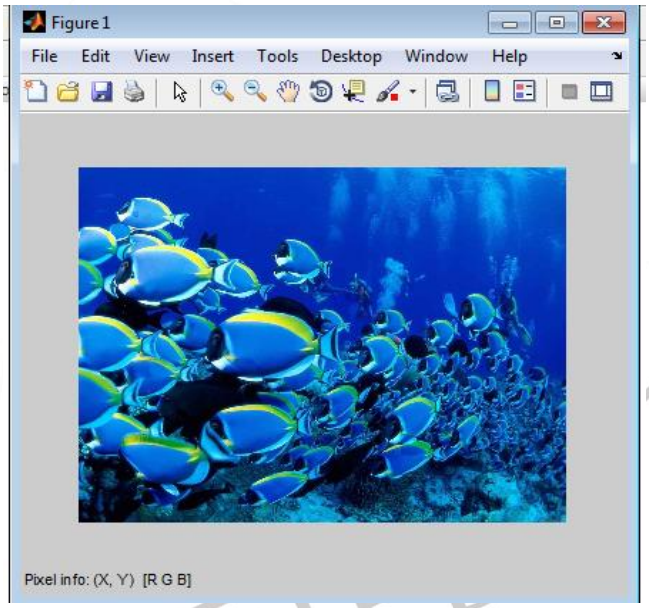

Fig 2.Original Underwater Image

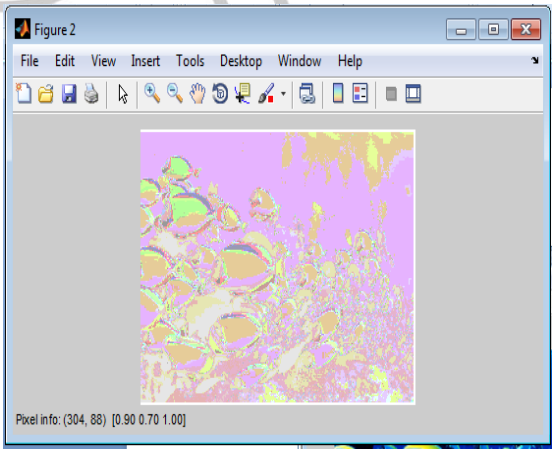

Fig 3 Image segmentation by fuzzy c means clusters(5 clsutering)

```
Command Window
Iteration count = 29, obj. fcn = 4103.825293
Iteration count = 30, obj. fcn = 4103.730201
Iteration count = 31, obj. fcn = 4103.665207
Iteration count = 32, obj. fcn = 4103.620704
Iteration count = 33, obj. fcn = 4103.590191
Iteration count = 34, obj. fcn = 4103.569249
Iteration count = 35, obj. fcn = 4103.554864
Iteration count = 36, obj. fcn = 4103.544978
Iteration count = 37, obj. fcn = 4103.538180
Iteration count = 38, obj. fcn = 4103.533504
Iteration count = 39, obj. fcn = 4103.530287
Iteration count = 40, obj. fcn = 4103.528073
Iteration count = 41, obj. fcn = 4103.526550
Iteration count = 42, obj. fcn = 4103.525501
Iteration count = 43, obj. fcn = 4103.524779
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Iteration count = 45, obj. fcn = 4103.523939
Iteration count = 46, obj. fcn = 4103.523704
Iteration count = 47, obj. fcn = 4103.523541
Iteration count = 48, obj. fcn = 4103.523430
Iteration count = 49, obj. fcn = 4103.523353
Iteration count = 50, obj. fcn = 4103.523300
Iteration count = 51, obj. fcn = 4103.523263
Iteration count = 52, obj. fcn = 4103.523238
Iteration count = 53, obj. fcn = 4103.523221
Iteration count = 54, obj. fcn = 4103.523209
Iteration count = 55, obj. fcn = 4103.523200
Elapsed time is 54.637036 seconds.
fx >>
```

Fig 4Time taken by fuzzy c means clusters(5 clusters)

```
Command Window
>> y=mutualinfo(I,f4)

y =

    2.3271

fx >>
```

Fig 5Mutual Information of fuzzy c means clusters(5 clustering)

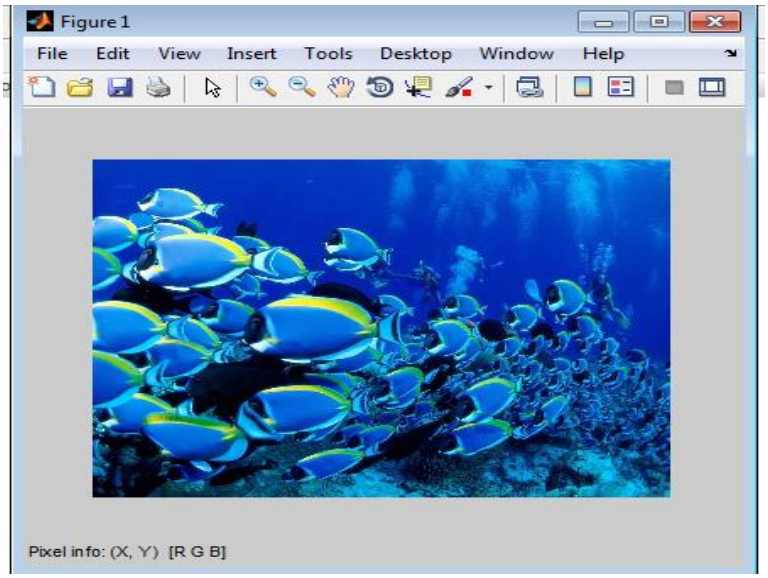

Fig 6.Original Underwater Image

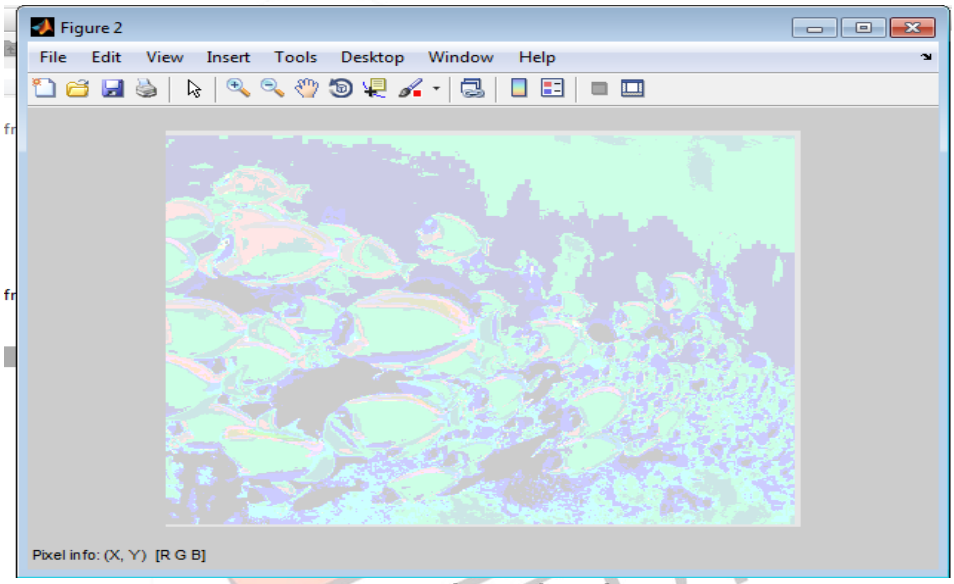

Fig 7.Segmented Image by 3 clusters

```
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Iteration count = 25, obj. fcn = 13161.474677
Iteration count = 26, obj. fcn = 13161.389264
Iteration count = 27, obj. fcn = 13161.337080
Iteration count = 28, obj. fcn = 13161.305189
Iteration count = 29, obj. fcn = 13161.285694
Iteration count = 30, obj. fcn = 13161.273776
Iteration count = 31, obj. fcn = 13161.266488
Iteration count = 32, obj. fcn = 13161.262032
Iteration count = 33, obj. fcn = 13161.259306
Iteration count = 34, obj. fcn = 13161.257639
Iteration count = 35, obj. fcn = 13161.256619
Iteration count = 36, obj. fcn = 13161.255996
Iteration count = 37, obj. fcn = 13161.255614
Iteration count = 38, obj. fcn = 13161.255381
Iteration count = 39, obj. fcn = 13161.255238
Iteration count = 40, obj. fcn = 13161.255151
Iteration count = 41, obj. fcn = 13161.255097
Iteration count = 42, obj. fcn = 13161.255065
Iteration count = 43, obj. fcn = 13161.255045
Iteration count = 44, obj. fcn = 13161.255032
Iteration count = 45, obj. fcn = 13161.255025
Elapsed time is 27.672138 seconds.
>>
```

Fig 8.Time taken by 3 clusters

```
Command Window
Iteration count = 25, obj. fcn = 13161.474677
Iteration count = 26, obj. fcn = 13161.389264
Iteration count = 27, obj. fcn = 13161.337080
Iteration count = 28, obj. fcn = 13161.305189
Iteration count = 29, obj. fcn = 13161.285694
Iteration count = 30, obj. fcn = 13161.273776
Iteration count = 31, obj. fcn = 13161.266488
Iteration count = 32, obj. fcn = 13161.262032
Iteration count = 33, obj. fcn = 13161.259306
Iteration count = 34, obj. fcn = 13161.257639
Iteration count = 35, obj. fcn = 13161.256619
Iteration count = 36, obj. fcn = 13161.255996
Iteration count = 37, obj. fcn = 13161.255614
Iteration count = 38, obj. fcn = 13161.255381
Iteration count = 39, obj. fcn = 13161.255238
Iteration count = 40, obj. fcn = 13161.255151
Iteration count = 41, obj. fcn = 13161.255097
Iteration count = 42, obj. fcn = 13161.255065
Iteration count = 43, obj. fcn = 13161.255045
Iteration count = 44, obj. fcn = 13161.255032
Iteration count = 45, obj. fcn = 13161.255025
Elapsed time is 27.672138 seconds.
>> y=mutualinfo(I2,f4)

y =

    1.5281
```

Fig 9 Mutual information of 3 clusters

V CONCLUSION

After evolution we can conclude that Fuzzy C means clustering method retain more information from an image but it takes more time to segment the images.

VI FUTURE WORK

To decrease the time taken by fuzzy c means clustering.

VII PROPOSED WORK:

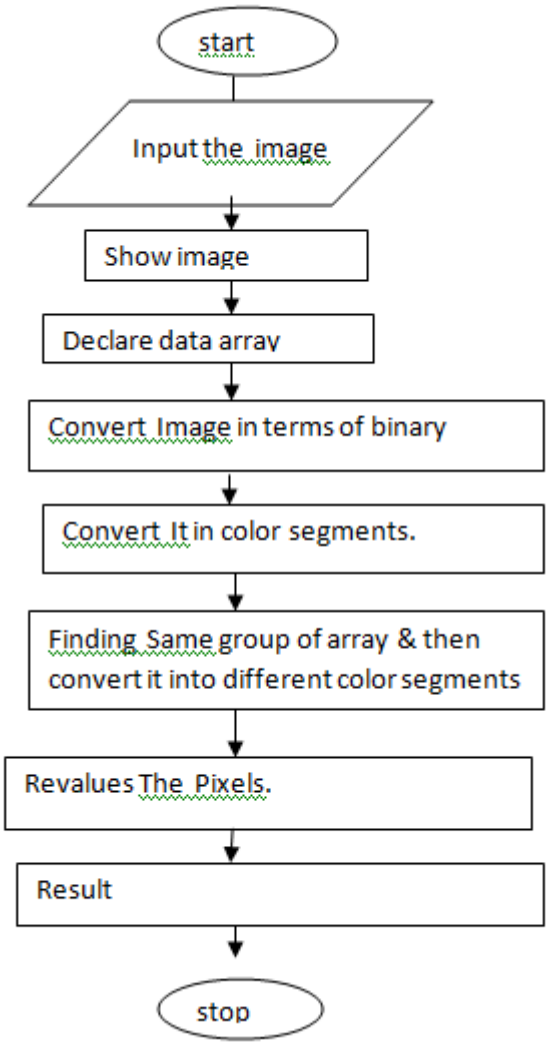

Fig 10 Proposed Work

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