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REGION BASED IMAGE SEGMENTATION

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Abstract- This paper is based on region based image segmentation. The existing algorithms for region based image segmentation are watershed algorithm marker controlled watershed and mean shift that are listed below with the results. The problems that persist in the above algorithms are as follows: In the watershed algorithm the image is over-segmented and in mean shift certain objects with similar density values are clubbed together as one. Our proposed algorithm overcomes all these issues and the experiment and results are listed below.

I. INTRODUCTION

Image segmentation is basically subdividing an image into its component regions or objects. We should stop segmenting an image when objects of interest in an application have been isolated. Segmentation allows to extract objects from the image. Segmentation can also be described as a process of grouping the pixels together that have similar attributes. After successfully segmenting an image, objects can be extracted. Shape of the extracted objects can be identified and described. Based on shape, texture and color objects can be identified[5].

Fig 1.a Original Image

Fig 1.bSegmented Image

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II.EXISTING ALGORITHM

A. WATERSHED ALGORITHM

Watershed method is one of the commonly used techniques in the process of image segmentation. Now it is being recognized as one of the powerful methods used for the purpose of image segmentation for its main advantages like its complete division of an image its simplicity and speed. This is a method that follows the approach of image-based image segmentation. In cases where the expected target region has weak boundaries and low contrast this transformation technique provides closed contours. This is a technique based on grey scale morphology. A case where in a landscape or topographic relief is flooded with water, the watersheds are formed by the divide lines of the domains of rain falling over the regions. The drop of water that falls on a topographic relief flows towards the "nearest" minimum. The steepest part ends with the minimum which is also known as the nearest minimum. It occurs in a case where the point lies in the catchment of the basin of the minimum[1].

STEP1:Find the boundary value pixels and note the minimum value. The pixels of g(x,y) are to be found which are the boundary values and its minimum value is to be assigned to Mi. Let Cn(Mi) be the coordinates in the catchment basin that are associated with minimum i.e. Mi.

STEP2: Once the above step is completed,Compute its catchment basins$Cn(Mi) = C(Mi) \cap T[n]$

STEP3: Derive the set of connected components Derive the set of connected components in T[n] that are denoted as Q. For each of the connected component, which consists of these three conditions:

- If the connected components are empty it represents that a new minimum is encountered.
- If the connected components contain at least a single connected component it means that the connected components lie within the catchment basin of some its local minimum.
- If the connected components contain multiple connected components it represents all or part of ridge separating two or more catchment basins and which are set as the “dam”.

STEP4: Finally construct dam for all the available catchment basins. Construct C[n] using the previously obtained values for Cn(Mi)

Figure 2.a Original Image

Figure 2.bOver-segmented image by applying watershed algorithm

B. MARKER CONTROL WATERSHED ALGORITHM

A marker is a component which is connected and belongs to an image. All the connected components possess same intensity values and are treated as the local minima. Based on the region of interest the markers are classified as internal i.e. the foreground and external i.e. the background. With the use of markers priori knowledge is gained about segmentation; it often consists in the number and position of regions through definition of certain markers, which streamlines the problem of over-segmentation of an image[2-5].

The basic procedure followed by marker-controlled watershed segmentation follow the procedure given below.

- Segmentation function needs to be computed. The objects trying to be segmented are the dark regions of the image.
- Foreground markers are to be computed. Each object contains connected blobs of pixels
- Now, the background markers are to be computed. They are pixels that aren't a part of any objects.
- After computing the background markers, the segmentation function needs to be altered so that only its minima are in the foreground and background marker locations.

Finally compute the watershed of the modified segmentation function

a) <u>Advantages</u>

- Simplicity
- Speed
- Complete division of the image

b) <u>Disadvantage</u>

- Over-segmentation of an image

Figure 2.c Original Image

Figure 2.d Image Produced Marker Controlled Watershed

C. MEAN-SHIEFT ALGORITHM

Mean- shift is a non-parametric feature-space analysis technique for locating the maxima of a density function given discrete data sampled from that function.

It is useful for detecting the modes of this density.
Mean-shift is a data-clustering method that searches for the local maximal density points and then groups all the data to the clusters defined by these maximal density points[6].

MEAN-SHIFT PROCEDURE

- Start with a random region of interest.
- Determine a centroid of the data.
- Move the region to the location of the new centroid.
- Repeat until convergence.

Advantages

- Mean shift is an application-independent tool suitable for real data analysis.
- Does not assume any predefined shape on data clusters.
- The procedure relies on choice of a single parameter: bandwidth.

Disadvantages

- The selection of a window size is not trivial. Inappropriate window size can cause modes to be merged.

Figure 2.e Original image

Figure2.f Image obtained after applying mean-shift Method

III. EXPERIMENT AND RESULT

The test set for this evaluation experiment image randomly selected from the internet. Matlab 7.12.0 software platform is use to perform the experiment. The PC for experiment is equipped with an Intel Core i5 2.4 GHz Personal laptop and 8GB memory.

A. PROBLEM DESCRIPTION

Even though the use of watershed algorithm yields optimal results in the region based segmentation, in certain cases the problem faced using this algorithm is over segmentation of the image. This problem can be overcome by using the marker controlled watershed algorithm.

B. Proposed approach

1. Apply Meanshift algorithm to the input image.
2. Use the output of the Mean shift as input to Marker controlled watershed.
3. Read the Colored Image and Convert it to Grayscale
4. Use the Gradient Magnitude as the Segmentation Function
5. Mark the Foreground Objects
6. Compute Background Markers
7. Compute the Watershed Transform of the Segmentation Function.
8. Visualize the Result

The figures shown beloware explained as following:

Fig 3.a depicts the Mean shift algorithm that is appliedto the input image. Fig 3.b is the Grayscale image of the inputted colored image.

Figure 3.aOriginal Image

Figure 3.bGrayscale Image

Fig 3.c is the output of the Mean shift as input to Marker controlled watershed. Fig 3.d depicts the image produced by Marker Controlled Watershed algorithm.

Figure 3.cMean Shift as Input to Marker Controlled Watershed Method

Figure 3.dImage produced by Marker Controlled Controlled Watershed Method

Fig 3.e depicts the computation of Watershed Transform of Gradient magnitude. Fig 3.f depicts the foreground and background markers superimposed on Original image.

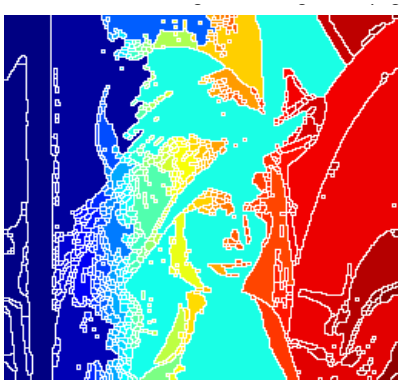

Figure 3.eWatershed transform of Gradient Magnitude

Figure3.fMarkers and object boundaries Superimposed on original image

Fig 3.g shows the Final image produced by the proposed approach.

Figure3.gResultant Image

IV.CONCLUSION

From the above experiments conducted and the obtained results we can conclude that the problem encountered of over-segmentation of the image is significantly reduced and clubbing of the objects together also doesn't occur in case of the Meanshift algorithm.

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