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Modified Approach for Image Segmentation Using Hierarchical Merge Tree Techniques

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ABSTRACT

Image segmentation is the method in which image can be divided into multiple parts. Each part of image contains tag. This tags can be assign on the basis of edge detection, region based technique, color and texture. The tags combine together using hierarchical merge tree approach. It uses tree structure as constrain conditional model for region merging of image. In image segmentation initially image converted into grayscale and after that noise removal technique removes all the noise of the image and then combination of merge tree occurred from every iteration. We developed system of counter based detection based on segmented result. In experimental result time complexity of existing system and proposed system can be form.

Keywords

Image Segmentation, Constrained Conditional Model, Hierarchical Merge Tree, Counter based Object Detection.

1. INTRODUCTION

Now a day, Image processing is speedily increasing technology. It is a way to convey image into digital form by performing some operation on it. Image segmentation is a most important element in image processing. In which digital image can be divided into multiple parts [1]. Segmentation is to modify the representation of an image into somewhat that is more meaningful and easier to examine. Image segmentation is a set of segments that collectively wrap the entire image [1, 2]. Figure 1 shows the Image segmentation.

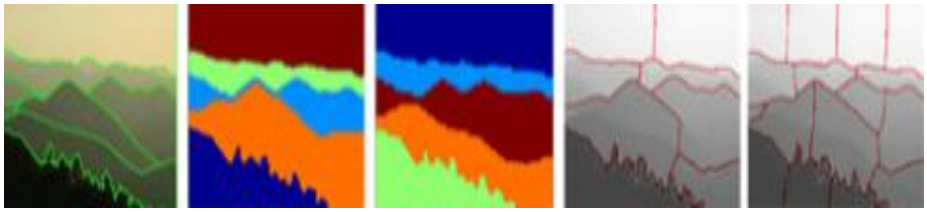

Figure 1: Image Segmentation.

A. Constrained Conditional Model

Image segmentation uses merge tree structure as a constrained conditional model for region merging and provides superior result with high efficiency. In constrained conditional model, tag is allocated to each section of node. Every node indicates that its children are merging or not [3]. It uses the top-down and bottom-up approach.

i. Top-down approach:

A top-down approach is to breaking down of a structure to get near into its compositional sub-systems in a reverse engineering fashion. In a top-down approach an outline of the system is formulated, specifying, but

not detailing, any first-level subsystems [4]. Top down approach starts with the large picture, it breaks down from there into smaller segments. In this approach it uses two main stages: learning and segmenting [5].

ii. Bottom-up approach:

Bottom-up processing is a part of information processing based on incoming data since the environment to form a perception. These elements are then connected together to form better subsystems, which then in turn are linked, sometimes in various levels, until a whole top-level system is formed [5,6]. It mainly connects the arriving image, without using stored item representation. It uses the region based properties such as color, intensity, texture [6].

B. Merge Tree Approach

In hierarchical merge tree approach, image is separated into a number of segments. In each section of image tag is assigned then each tag is joint using their color and texture [7]. Merge algorithms are a family of algorithms that take various sorted lists as input and create a single list as output, containing all the elements of the inputs lists in sorted order [8].

2. RELATED WORK

The System architecture carries the flow of image segmentation. It contained various techniques like; the image can be divided into three parts which are Grey scale, Segmentation and Noise removal. The segmentation can also be converted into three parts which are Gradient Filter, Non max suppressed image and strong edge segmentation. Figure 2 shows the System architecture of Image Segmentation given below,

i. System Architecture:

In system architecture we represent the system which contains both the hierarchical merge tree approach or contour based object recognition approach. We compare both previous system as well as our system.

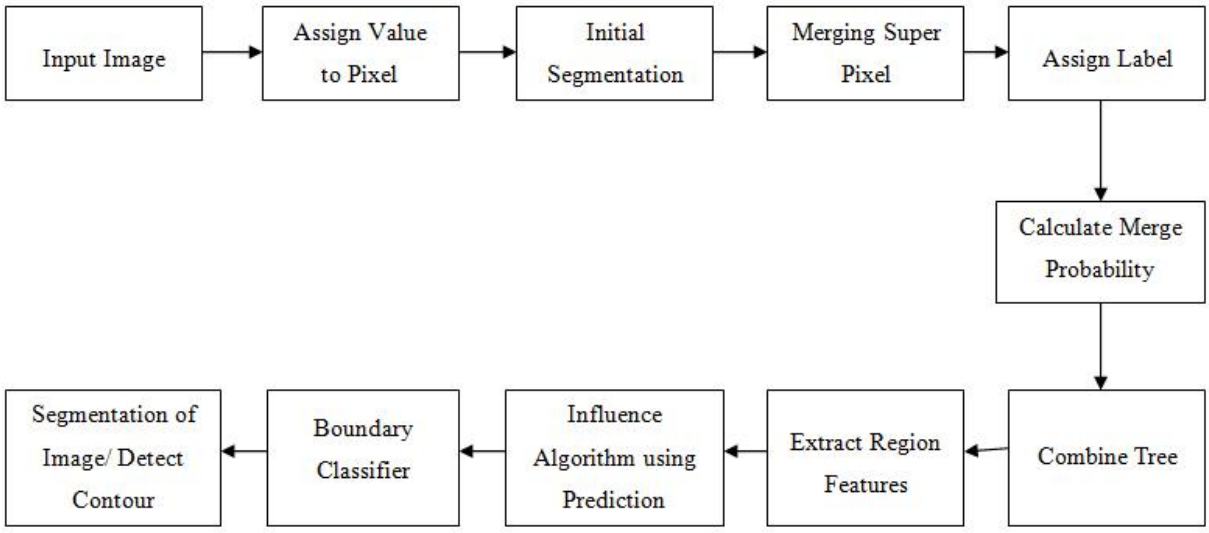

Figure 2: System Architecture.

The Figure 2 shows the system architecture in that, first we take one image as an input to the system then each pixel of the image the value can be assigned. After that, image can be divided into many parts which are known as segments. It uses the edge detection technique for segmentation. Then every segment of image contain its own label, by using constrain conditional model the probability of each merge can be calculated. The region is same then it can be merging or region is not same then it cannot merge. The region of the image can be extracted which is depends on its intensity, color, size or texture. It can use the top-down and bottom-

up algorithm. After that boundary between two regions is highlighted which shows the region is exists or not. Our contribution to this system is we can combine the merge tree model through each iteration and develop a system which is contour based object detection, in that particular object in the image can be identified.

ii. Grey Scale Process

A gray scale is an image in which the value of each pixel is a single model, that is, it carries only intensity data. It also known as black-and-white, are composed entire shades of gray, varying from black at the weakest intensity to white at the strongest. In grey scale method simple image can be converted into grey scale form.

iii. Segmentation Techniques

The goal of segmentation is to alter the representation of an image into impressive that is more consequential and easier to consider. Image segmentation is usually used to place objects and boundaries in images. More purposely, image segmentation is the method of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics. In image segmentation method image can be divided into gradient filter, non max suppressed image and strong edges segmentation.

iv. Noise Removal Method

Noise reduction is the process of removing noise from a signal. All recording devices, both analog and digital, have traits that make them susceptible to noise.

3. PROPOSED APPROACH

A. Counter based Object Detection

Object recognition is a process for identifying a specific object in a digital image or video. It can identify the particular item through the image using their color or shape. Objects can yet be recognized when they are partially blocked from view [9]. An initial set of features association is first generated. The method explores the neighboring area trying to build more and more matching features from initial one [10]. Contour is an important cue for object recognition. Contour is a significant sign for object recognition. There are two mechanisms for our proposed feature: One is a contour patch detector for detecting image patches with interesting information of object contour, which we call the Maximal/Minimal Torque Patch (MTP) detector. The other is a contour patch descriptor for characterizing a contour patch, which we call the Multi-scale Torque (MST) descriptor.

i. Maximal/ Minimal Torque Patch (MTP)

The torque magnitude μτ is dependent on how tight the boundaries of patches enclose regular salient contours. Thus, based on the value of μ (τ), we propose a local contour detector for finding local patches with regular contours. We define a patch as a maximal/minimal torque patch if its torque magnitude takes a maxima/ minima among the torque magnitudes of all patches of multiple sizes but with the same center and is maximum/ minimum among the spatial neighbors [11]

Algorithm 1 Maximal/Minimal Torque Patch (MTP) Detector

Input: an image

1. **Torque calculation of patches:** The image is partitioned into multiple patches of different sizes, and the torque magnitude of each patch is calculated using (6).

2. **Extrema detection:** For each candidate patch, locate the candidate MTP patch whose torque magnitude takes the extreme value (maxima or minima) in its spatial-and-scale neighborhood.

3. **Patch thresholding:** Remove all patches from the set of all candidates MTP patches whose torque magnitudes are below some pre-defined threshold.

Output: The MTP patch set R.

ii. Multi-scale Torque (MST) descriptor

A torque-based descriptor used to describe the density and variance of the local edge structure in a multi-scale manner. The MST descriptor is the concatenation of the torque magnitudes of these patches. To keep the number of selected patches the same for all patches, the step size is adapted to the patch size [11].

4. EXPERIMENTAL SETUP AND RESULTS

The experimental result shows the Hierarchical Merge Tree Model against Propose Method which is Counter based Object Detection. The Fig 3 shows,

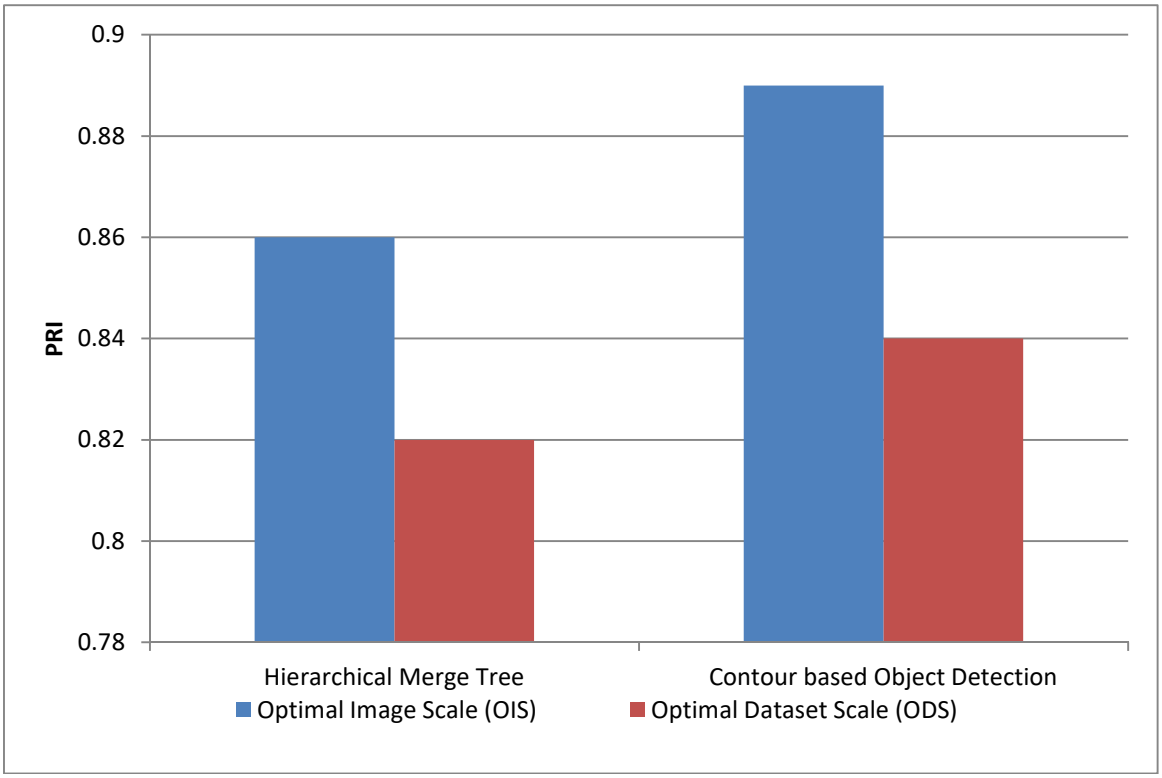

Figure 3: HMT against Proposed System.

Table 1: For BDS300 Dataset.

	PRI	
	OIS	**ODS**
HMT	0.86	0.82
COD	0.89	0.84

J Time Complexity of System:

We present the time complexity graph for the system which shows the time required to perform operation in HMT is more than COD. The time complexity of proposed system is less than existing system. We can get result in more accurate form using our system. It also helps us to find out the better solution for our work. It reduces the time complexity so we can get the solution with very less time and its accuracy is also better so we can get the accurate result.

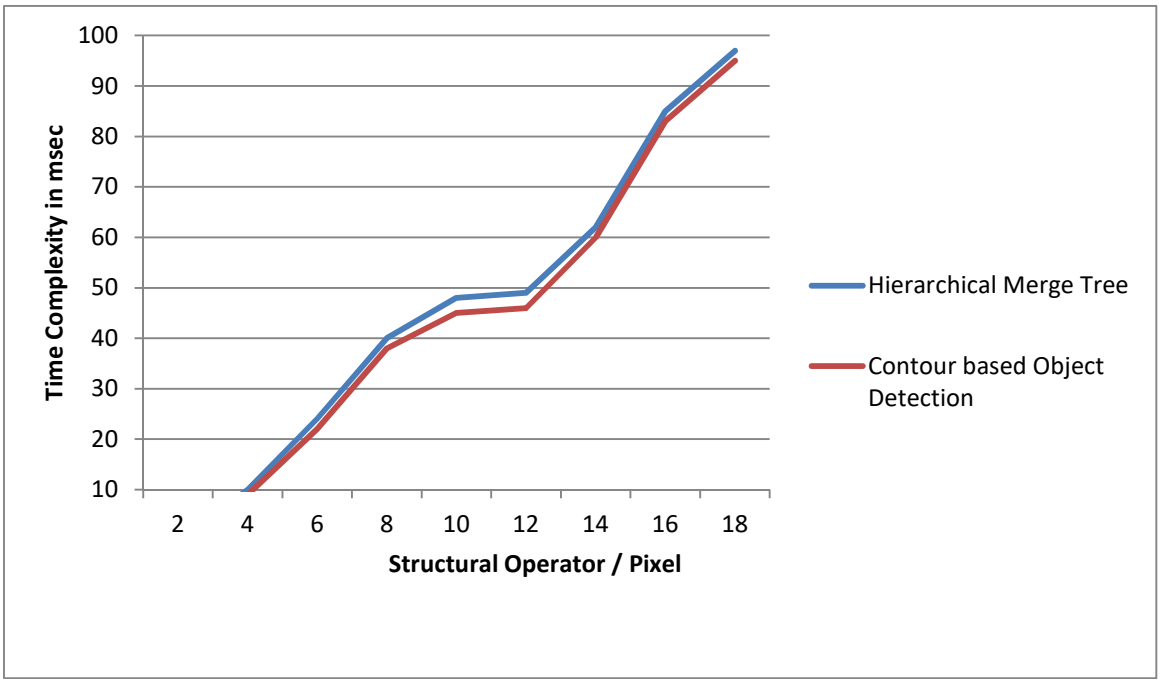

Figure 4: Time Complexity Graph for the System.

Table 2: For Complexity Graph of System.

	Hierarchical Merge Tree	Contour based Object Detection
2	0	0
4	10	9
6	24	22
8	40	38
10	48	45
12	49	46
14	62	60
16	85	83
18	97	95

CONCLUSIONS

In this paper, we have to studied hierarchical merge tree techniques for image segmentation. We observed that different techniques used to divide image into multiple segment. Image can be divided into many parts each part contains its label. In this we develop system of counter based object detection based on this segmentation. We developed system of counter based detection based on segmented result. In experimental result time complexity of existing system and proposed system can be formed.

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