International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 02 Issue: 02 | May-2015 www.irjet.net p-ISSN: 2395-0072

Segmentation of Historical documents using Region Based Segmentation Method

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Abstract-*Nowadays the quantity and quality of the historical stone in-scripted documents move towards downwards. Here in our present proposal main concentration on digitization of these documents. Image segmentation is one of the important processes in in the digital image processing. In the optical character Recognition (OCR) segmentation and image mosaic plays an important role. Here in this work the segmentation type will be Region Based segmentation. In this proposal we use this segmentation method on Historical Ganga and Ashoka documents. In this work, we propose a hierarchical region-based approach to joint object detection and image segmentation. Our approach simultaneously reasons about pixels. Pixel appearance features allow us to perform well on classifying amorphous background classes, while the explicit representation of regions facilitate the computation of more sophisticated features necessary for object detection. Importantly, our model gives a single unified description of the scene—we explain every pixel in the image and enforce global consistency between all random variables in our model.*

Keywords: *Historical Ganga and Ashoka, Region Based segmentation*

INTRODUCTION

In this work first we need to collect the database of Ganga and Ashoka historical documents from the different places, where those belongs according to the era. After creating database passes these images through the preprocessing stage. In this present work used a Guassian and Median filters for preprocessing. After completing the enhancement of the image next proceeds a Segmentation.

In this proposal we mainly concentrates on the Region Based Segmentation method. In the image object detection is one of the great challenges of computer vision, having received continuous attention since the origin of the field. The most commonly used modern approaches scan the image for candidate objects and score each one. This is typified by the sliding-window object finding [20,22,4], but it is also true of most other detection schemes such as centroid based [13]methods or boundary edge detection[5].

This region based post-processing method applied only after the image is converted to either gray level or it's in binary. Because in RGB we cannot differentiate the foreground and background. But in case of gray level only two levels that is 0 and 255, then select the approximate threshold value and then apply the region based segmentation. And in case of binary image also it contains the two values either 0 or 1.

In this work, we propose a more integrated region-based approach that combines multi-class image segmentation with object detection. Specifically, we propose a hierarchical model that reasons simultaneously about pixels, regions and objects in the image, rather than scanning arbitrary windows. At the region level we label pixels as belonging to one of a number of background classes (lines, different styles of characters including circles, squares) or a single foreground class.

ALGORITHM

- Creating a database of stone In-Scripted Ganga and Ashoka historical documents with the help of 16 Megapixel camera.
- Crop the unwanted objects at the edges of the captured image.
- These cropped images are enhanced with the help of different filtering methods.
- After enhancement of the image passes through a post-processing stage it involves a segmentation. Here Region Based segmentation method is used.

METHODOLOGY

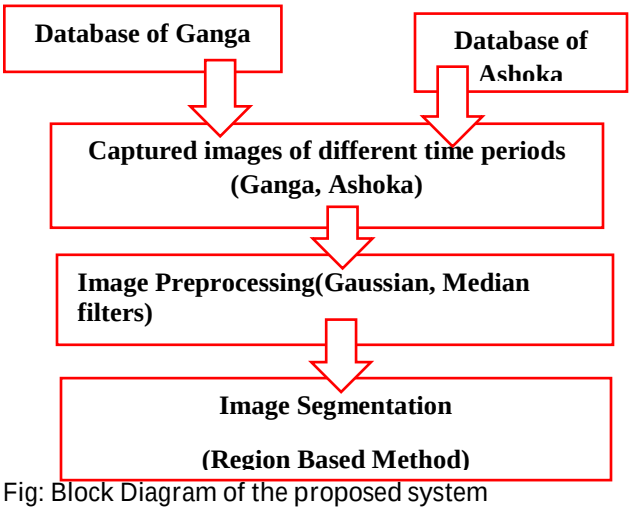

Fig: Block Diagram of the proposed system

DATABASE

The database for this proposal will be the stone in-scripted Ganga and old Ashoka documents are collected from different places. The Ganga text documents are available in Shravanabelagola, located in Hassan District. And Ashoka document is collected in the archeology department in the Hassan. These documents collected or captured using 16Megapixel camera.

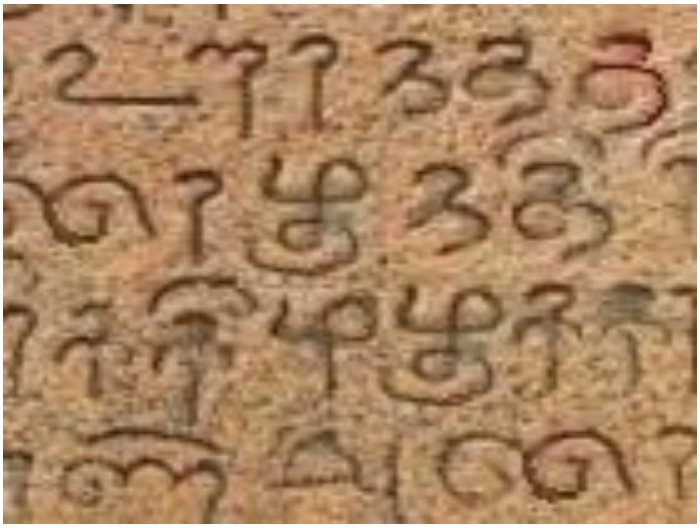

Fig: Stone in-scripted Ganga document

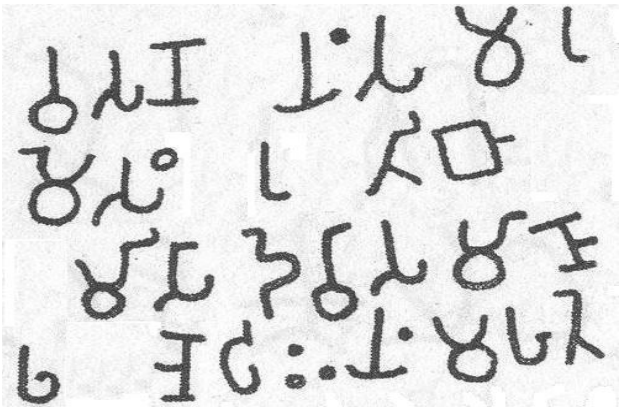

Fig: Historical Ashoka document

IMAGE PREPROCESSING

After creating the database next we need to achieve the enhancement or preprocessing of the image. The enhancement means removal of noise from the captured image. If necessary we need to resize the image. After resizing applied different filtering techniques to eliminate the nois present in the image. In our proposal Gassian and Median filtering techniques are applied on the captured image.

The Gaussian smoothing operator is a 2-D convolution operator that is used to `blur' images and remove detail and noise. It uses a kernel that represents the shape of a Gaussian (`bell-shaped') hump. This kernel has some special properties which are detailed below. The Gaussian distribution in 1-D has the form:

$$G(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{x^2}{2\sigma^2}}$$

Where σ is the standard deviation of the distribution. We have also assumed that the distribution has a mean of zero (*i.e.* it is centered on the line *x*=0). The distribution is illustrated in Figure

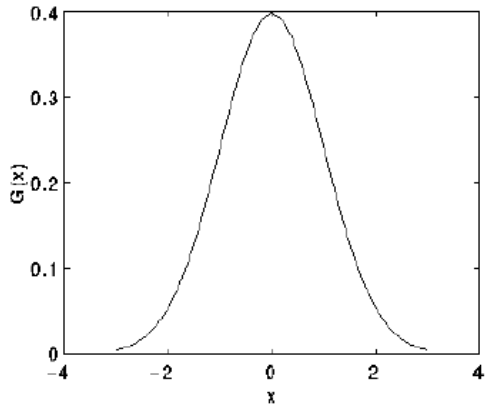

Fig: 1-D Gaussian distribution with mean 0 and σ=1

In 2-D, an isotropic (*i.e.* circularly symmetric) Gaussian has the form:

$$G(x,y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$$

The distribution shown in the below figure:

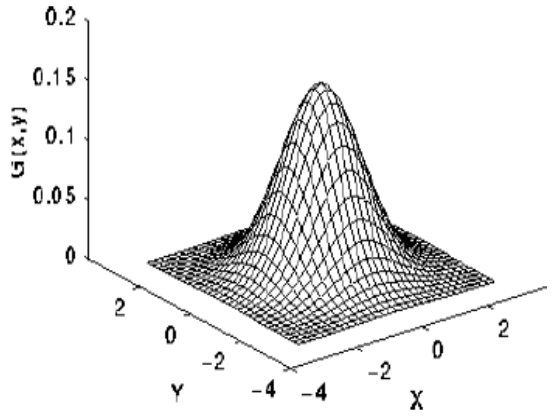

Fig: 2-D Gaussian distribution with mean (0, 0) and σ=1

The idea of Gaussian smoothing is to use this 2-D distribution as a `point-spread' function, and this is achieved by convolution. Since the image is stored as a collection of discrete pixels there is a need to produce a discrete approximation to the Gaussian function before we can perform the convolution.

Component of Median Filter

Select a captured noisy image from the 16 Mega Pixel camera from different places of different era. The captured noisy image color, separate each plane using digital image processing tool box in MATLAB commands. Each separated scalar component is treated independently. After separating the planes generate zero arrays around an image based on image mask size using pad array command. After this select 3*3 masks from an image and the mask should be odd sized mask. After generating the odd sized mask sort the pixel values with in the mask in ascending order. Each component of each point under the mask a single median component is determined. These determined components are then combined to form a new point which will be used represent the point in the signal studied. After this restore the target image and measure the Mean Square Error and Peak Signal to Noise Ratio value.

IMAGE SEGMENTATION

After completing the image enhancement next stage is to apply segmentation method. The region based segmentation is applied only on the gray level image or binary image. Because we need to differentiate the foreground and background. In the gray level image there are two values lower limit '0' and upper limit '255', in this condition we select one threshold value and enhance , then next need to detect the objects here (objects is nothing but the characters here) based on the connected pixels and boundary boxes we achieve the segmentation. Boundary box is nothing but it covers the character based on its area and dimension. The large area characters are segmented first afterwards remaining characters will segmented. In the region based segmentation first it calculates the area of the each object here object is nothing but characters and in the ascending order segmentation starts.The boundary box and segmented process as shown below

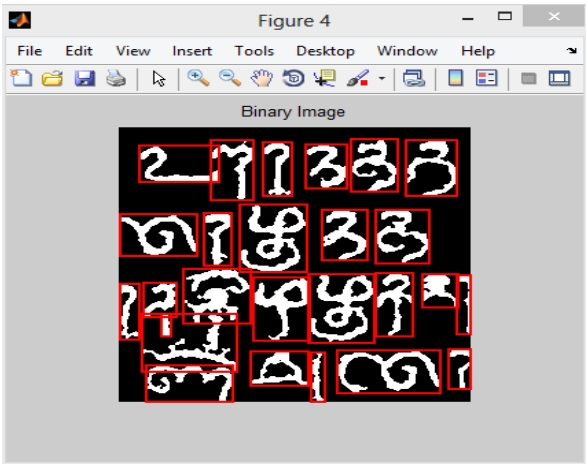

Fig: Region based segmentation process applied to Ganga stone in-scripted document

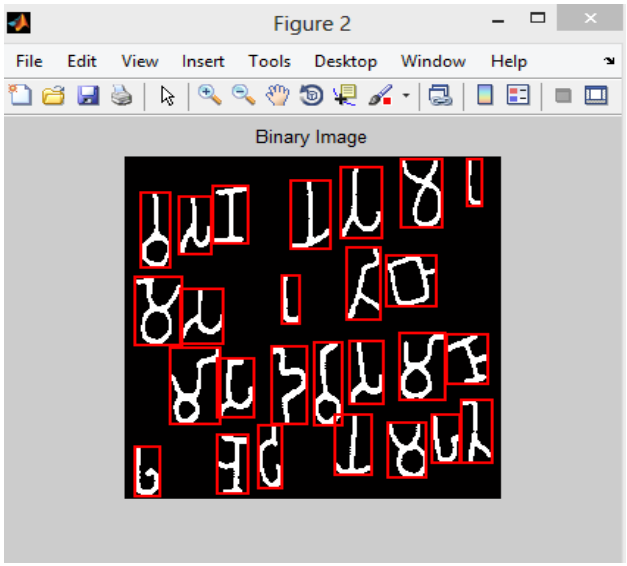

Fig: Region based segmentation applied to historical Ashoka document

Results and Discussions

After applying the segmentation methods these paragraph images are segmented into single characters as shown below (here in result we display only limited characters)

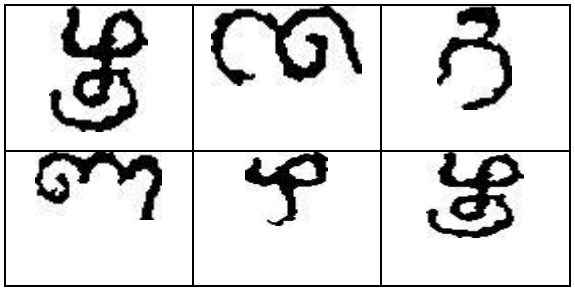

Table1: Segmented characters of Stone in-scripted Ganga document

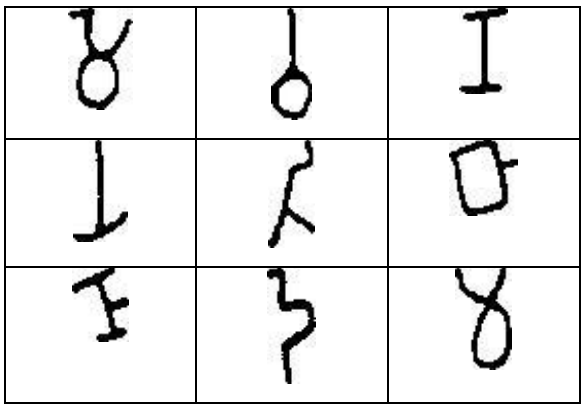

Table2: Segmented characters of historical Ashoka document

CONCLUSION

In this paper we have presented a hierarchical model for joint object detection and image segmentation.Our novel approach overcomes many of the problems associated with trying to combine related vision tasks. Importantly, our method explains every pixel in the image and enforces consistency between random variables from different tasks. Furthermore, our model is encapsulated in a modular energy function which can be easily analyzed and improved as new computer vision technologies become available. Our work suggests a number of interesting directions for future work. First, our greedy inference procedure can be replaced with a more sophisticated approach that makes more global steps. More importantly, our region-based model has the potential for providing holistic unified understanding of an entire scene.

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	Mr. Pradeepa R obtained B.E degree in Electronics and Communication Engineering from Visvesvaraya Technological University during 2010-11, pursuing M.Tech in Digital Electronics and Communication Systemsat Malnad College of Engineering, Hassan. Presently, he undertaking his academic project on classification and recognition of stone in-scripted ancient kannada characters using SVM method at MCE, HASSAN.
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