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Document Image Binarization using Image Segmentation

Shivani Pawar[1], Prof. KishorShegde[2] ,Prof. Devidas Thosar[3]

[1]*PG Student, Computer engineering SVIT College,ChincholiNashik,Maharastra,India*
[2]*Professors,Computer engineering Dept, SVIT College,ChincholiNashik,Maharastra,India*

Abstract -Evolution of digital devices and computers makes an increasing attraction in document image analysis. Many of the paper documents have been transferred and stored using digital devices in large manner. We will do image enhancement techniques to reduce the noises from degraded document images. Segmentation of text from badly degraded document images is a very challenging task due to the high Inter/Intra variation between the document background and the foreground text of different document images. Pattern recognition and image processing algorithms take more time for execution on a single-core processor. Graphics Processing Unit is more popular nowadays due to its low cost, speed, programmability and more in built execution cores in it. Our main goal is to make binarizationfaster for recognition of a large number of degraded document images on GPU. We provide a new image segmentation algorithm that each pixel in the image has its own threshold proposed. We will do parallel work on a window of m*n size and extract object pixel of text stroke of that window. The document text is further segmented by a local threshold that is estimated based on the intensities of detected text stroke edge pixels within a local window.

Key Words :Image Segmentation , Pixel classification, GPU, Parallelization, Binarization, Mean Filter

1.INTRODUCTION

Document Image Binarization is performed in the pre- processing stage for document analysis and it aims to segment the foreground text from the document background. A fast and accurate document image binarization technique is important for the ensuing document image processing tasks such as optical character recognition. The thresholding of degraded document images is still an unsolved problem due to the high Inter/Intra variation between the text stroke and the document background across different document images. As illustrated in Fig. 2, the handwritten text within the degraded documents often shows a certain amount of variation in terms of the stroke brightness, stroke width, stroke connection, and document background. Historical documents are often degraded by different types of imaging artifacts. These different types of document degradations tend to induce the document thresholding error and make degraded document image binarization a big challenge to most state-of-the-art techniques.

Algorithms

- GrayscaleConversion
- Image Segmentation
- Post Processing

2. LITERATURESURVEY

A. *Existing System*

There are many thresholding techniques have been reported for document image binarization. As many degraded documents do not have a clear bimodal pattern so global thresholding is usually not a suitable approachfor the degraded document binarization. In adaptive thresholding which estimates a local threshold for each document image pixel is often a better approach to deal with different variations within degraded document images. The local image contrast and the local image gradient are very useful features for segmenting the text from the document background because the document text usually has certain image contrast to the neighbouring document background. They are very effective and have been used in many document image binarization techniques. The old system mainly uses a serial approach for processing document images. Due to this the processing time of an image is high therefore it takes more time to generate the output. A sub-domain of computer vision is a field that deals with the conversion of an image into digital form and perform some operations on it in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is an image like photograph or video frame and output may be image or characteristics associated with that image. An image processing system includes treating images as two-dimensional signals while applying already set signal processing methods to them. The purpose of image processing can be basically divided into 5 groups, namely:

1.Visualization: Observe the objects that are not visible.

2. Image sharpening and restoration: to create a better image.

3. Image retrieval: seek for the image of interest.

4. Measurement ofpattern: measures various objects in an image.

5. Image recognition: distinguish the objects in an image.

3.PROPOSED METHODOLOGY

Digital image processing has become an applied research area that goes from professional photography to several different fields such as meteorology, astronomy, computer vision, medical imaging among others. The aim of digital image processing is to improve the pictorial information in orderto perform subsequently other tasks such as image-based classification, pattern recognition or feature extraction . Image processing is usually a time-consuming and expensive task. The use of a GPU to parallelize tasks started several years ago, in 2004 proposed a new architecture using multiple GPUs for image processing and computer vision. They obtained significant speed up over a CPU implementation. Fast algorithms are important for efficient image processing systems for handling a large set of calculations. To speed up the processing parallel implementation of an algorithm can be done using the Graphics Processing Unit. GPU is general-purpose computation low cost and hardware programmability make it productive. Binarization is a widely used technique in recognition applications and image analysis. We investigate the accuracy and performance characteristics of GPUs on well-known globalbinarization.

A. Architecure

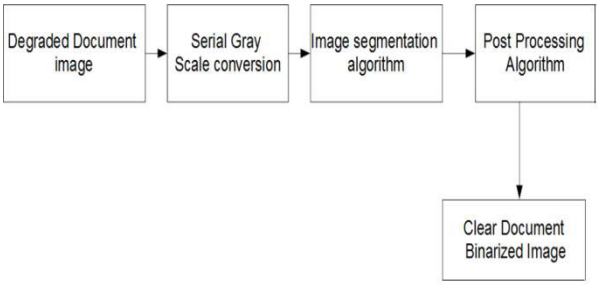


Fig 1.Architecture(Workflow of propsed system)

As the system starts we give degraded document images as the input to the system. Then the image is converted to grayscale format after that the image segmentation algorithm is applied to get the clear binarized image as output. The post-processing algorithm is applied to get character and image clearer and more readable. Some key features ofthe system are asfollow:

- Processing image using parallel computing.
- To generate Clear output from Degraded Images.
- Text StrokeIdentification.
- Parallel ImageSegment1ation

B. Algorithms

1. Algorithm for Gray Scale Image

Algorithm: Gray scale transformation in a serial approach.

Input: image vector 0

Output: GI gray scale image

1. for i = 0 to (width(I) ×height(I))do

2. GI[i] = (I[i×3] + I[i × 3 + 1] + I[i × 3 + 2])/3

3. End for

Algorithm :- Gray scale transformation

Input: image vector

Output: GSC gray scale image

1. For each GPU task i = blockidx.x ×(blockdim.x × blockdim.y) + blockdim.x × threadidx.y + threadidx.x;

2. GSC[i] = (I[i×3] + I[i × 3 + 1] + I[i × 3 + 2])/3

3. End for

2. Algorithm for Image segmentation

Image Segmentation Algorithm

1) Input:

i. G is Gray Scale image vector.

ii. Set threshold value th.

iii.Set window size Ws

iv. BZ forbinarized image vector.

2) For each row 1 to height -Ws

For each column 1 to width -Ws

Currpixel=G[row, column];

If

(currpixel<avg - th) label BZ [row, column]=0;

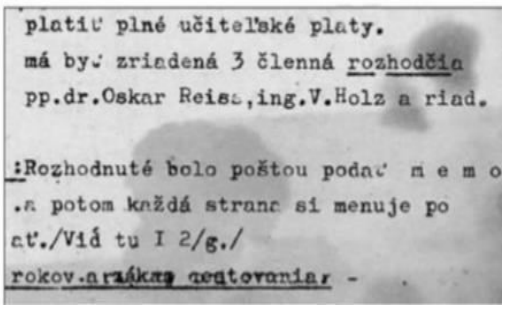
Else

Label BZ [row, column]=1;

End;

End;

Return binarized image BZ;



3. Algorithm for Post Processing

Post Processing Algorithm:

Input: The Input Document Image I , Initial Binary Result B and Corresponding Binary Text Stroke Edge Image Edge

Output: The Final Binary Result BF

1: Find out all the connect components of the stroke edge pixels in Edge.

2: Remove those pixels that do not connect with other pixels.

3: for each remaining edge pixels (i, j): do

4: Get its neighborhood pairs: (i − 1, j) and (i + 1, j);(i, j − 1) and (i, j + 1)

5: if the pixels in the same pairs belong to the same class (both text or background) then

6: Assign the pixel with lower intensity to foreground class (text), and the other to background class.

7: end if

8: end for

9: Remove single-pixel artifacts along the text stroke boundaries after the document thresholding.

10: Store the new binary result to BF.

C. Important modules

The various modules to be made are enlisted as follows:

- *Grayscale Module*

As we are giving degraded document images as the input to the system after passing the degraded document to the system the document will first converted into gray. For converting the document into grayscale we are applying a serial approach as well as a parallel approach so that we can calculate the time for both approaches to generate the result. From that we come to know which approach is fast.

In below figure degraded image is converted into grayscale image and at the end it will calculate result of both the approaches used for converting degraded image into grayscale.

- *Window intensity calculation*

After converting the document into grayscale we are calculating the intensity of each window for the document image in parallel approach and at the same time we are mapping the edge for each window in serial approach by canny edge detection for each window of the document image.

Fig.2. Example: Gray Scale Image

- *Image segmentation*

The window intensity calculation in done then we are applying the Image segmentation algorithm. We are dividing an image into segments and calculating the threshold value for each segment in the parallel approach. By applying the segmentation algorithm we will get the accurate threshold value for each segment of the document image.

- *Post Processing*

We are applying the post-processing algorithm in the last step to recognizing the letters in the document image. If the letters are type halfly then by post-processing algorithm the letters can be recognized automatically by the post-processing algorithm.

- *Mean Filtering*

Mean filter is a simple sliding window that replace the center value with the average of all pixel values in the window. The window or kernel is usually a square but it can be of any shape.

3. CONCLUSIONS

The system provides document image Binarization technique that is tolerant of different types of document degradation. The proposed technique is simple and robust only a few parameters are involved. We have presented an approach for document image processing using parallel computing using C# .Net. The gain in parallel maybe not very significant.

Thus we propose a parallel approach for Document Image Binarization Using image segmentation algorithm for generating a clear document image from giving degraded document images.

REFERENCES

[1] Vibhor Sharma, DhereshSoni, Deepak Srivastava,"Filtration Based Noise Reduction Technique in an Image", Published in 2019 on IEEE Explorer.

[2] Sehad, Abdenour, et al. "Ancient degraded document image binarization based on texture features." Image and Signal Processing and Analysis (ISPA), 2013 8th International Symposium on IEEE,2013.

[3] Nafchi, HosseinZiaei, Reza FarrahiMoghaddam, and Mohamed Cheriet. "Application ofPhase-Based Features and Denoising in Postprocessing and Binarization of Historical Document Images." Document Analysis and Recognition (ICDAR), 2013 12th International Conference on. IEEE,2013.

[4] Parker, Jon, OphirFrieder, and Gideon Frieder. "Automatic Enhancement and Binarizationof Degraded Document Images." Document Analysis and Recognition (ICDAR), 2013 12th International Conference on IEEE, 2013.

[5] D. Doermann and K. Tombre, "Handbook of Document Image Processing and Recognition. ", Published in 2014.

[6] Fabrizio Russo, ”An Image Enhancement Technique Combining Sharpening and Noise Reduction”, Published in 4 AUGUST 2002 on IEEE Explorer

[7] BhawnaDhruv; Neetu Mittal; MeghaModi,”Analysis of different filters for noise reduction in images”, Published in 14 May 2018 on IEEE Explorer.

[8] Pratikakis, Ioannis, Basilis Gatos, and KonstantinosNtirogiannis. ICDAR 2013 Document ImageBinarization Contest (DIBCO 2013). Document Analysis and Recognition (ICDAR), 2013 12th International Conference on IEEE,2013.