An analysis of the Seeded Region Growing Algorithm

Thavisha Tennakoon

ABSTRACT

Example Abstract. Abstract must not include subheadings or citations. Example Abstract. Abstract must not include subheadings or citations. Example Abstract. Abstract must not include subheadings or citations. Example Abstract. Abstract must not include subheadings or citations. Example Abstract. Abstract must not include subheadings or citations. Example Abstract. Abstract must not include subheadings or citations. Example Abstract. Abstract must not include subheadings or citations.

Please note: Abbreviations should be introduced at the first mention in the main text – no abbreviations lists. Suggested structure of main text (not enforced) is provided below.

Introduction

When you scan in a real life document into a computer, the file tends to include some unwanted visual noise which makes it difficult for the computer to read. Image binarization is a technique of image segmentation that can help clear up the image. This is done by separating the image into two classes, text and non-text.

Three different types of image binarization are seeded region growing, automatic thresholding, and topographic analysis using a water flow model. Seeded region growing lets the user pick a starting point for the seed and the algorithm will check neighbouring pixels for similar and determines the value of it. Automatic thresholding looks at the image and determines a thresholding level that all the pixels will look at. Topographic analysis simulates water droplets falling on the image in a 3d plane to determine the thresholding point.

The aim of the report is to analyze one image binarization algorithm which has been tested on multiple images with unwanted visual noise.

Algorithm

The algorithm that this report will be focusing on will be the seeded region growing algorithm. The idea of seeded region growing came about when L. Bischoff said “Humans will always need to place the seeds.”[1] This means that humans should be able to select the initial pixel value for the algorithm to branch from.

This algorithm is useful for document image binarization because "it is robust, rapid and free of tuning parameters." as stated by Rolf Adams and Leanne Bischof[2].

A drawback of this algorithm is that is requires a manually selected seed. This means that depending on the seed you can get a completely different solution because the pixels will lead to different regions each time.[3]

How to algorithm works

These are the steps on how to algorithm works.

- First, if there are no values selected for the initial seed, a figure window will open up for the user to manually select a seed.
- Next, we create a seed so we can add pixel to a black image.
- Then we evaluate the image intensity at the seed points as well as calculating the mean intensity.
- Grow 1 pixel seed, and remove previous seed (so you’ll get only new pixel perimeter).
- Evaluate image intensity over the new perimeter.
- If image intensity over new perimeter is greater than the mean intensity of previous perimeter (minus tolerance), than this perimeter is part of the segmented object.
- Repeat while there’s new pixel in seed, stop if no new pixel were added.

Results

Here is a comparison of four images before and after applying the seeded region growing algorithm. These images will also be compared with their respective 'ground truths'. The tolerance level is at 0.5.

For figure 1, you can see that most of the the image has been binarized. Pixel values close to black has remained unchanged. Also you can see that pixel values with a black barrier, like the loops in some letters, are not affected.

For figure 2, a lot of the text has been washed away with the background noise. This would be due to the tolerance level being too high.

For figure 3, again, a lot of text has been washed with the background. Since the original image's text has a few similar pixel values as the background they have been whited out.

For figure 4, the whole image has been turned to white here.

We will lower the tolerance level and see if that makes any changes.

References

[1] Rolf Adams and Leanne Bischof "Seeded Region Growing" IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 16, NO. 6, JUNE 1994

[2] Savneet Dhaliwal, Abhilasha Jain "A Survey on Seeded Region Growing based Segmentation Algorithms" International Journal of Computer Science and Management Research. Vol 2 Issue 6 June 2013 ISSN 2278-733X.

[3] Prof. R.K.Krishna2, Shilpa Dantulwar (Kamdi)1 "PERFORMANCE ANALYSIS USING SINGLE SEEDED REGION GROWING ALGORITHM" International Journal of Innovative Research in Advanced Engineering (IJIRAE). Volume 1 Issue 6 (July 2014) ISSN: 2349-2163