

BORANG PENGESAHAN STATUS TESIS

JUDUL: THE SEGMENTATION OF SATELLITE IMAGE USING REGION-BASED AND WATERSHED TRANSFORM TECHNIQUES.

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THE SEGMENTATION OF SATELLITE IMAGE USING REGION-BASED AND
WATERSHED TRANSFORM TECHNIQUES.

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Computer Science (Computer Networking)

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2013

DECLARATION

I hereby declare that this project entitled
**THE SEGMENTATION OF SATELLITE IMAGE USING REGION-BASED AND
WATERSHED TRANSFORM TECHNIQUES**

is written by me and is my own effort and that no part has been plagiarized without
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DEDICATION

Dear Parent

Thank you for your incessant support and encouragement. Your sacrifices and loves have helped me to achieve this accomplishment.

Dear Teachers and Supervisors

Thank you for your continuous support, knowledge and guidance.

Dear Friends

Thank you for all the information, guidance, and encouragement.

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Thanks a lot.

ABSTRACT

The image segmentation is a main part of image processing by segmenting the image into partition according to the objects identity. The goal of applying this segmentation is to make an unrecognized image into more meaningful and easier to recognize by human observers. In this project, the image segmentation is extracted to analyse the region-based and watershed transform techniques. These techniques are further analyzed to identify the best technique to be used in image segmentation. At the end of this project, the results and the comparison of the advantages and disadvantages of region-based and watershed transform techniques will be carried out. Thus, the best segmentation technique can be identified and used for various purposes.

ABSTRAK

Pembahagian gambar merupakan bahagian utama *image processing* dengan membahagikan gambar kepada beberapa bahagian mengikut jenis objek dalam gambar tersebut. Objektif pembahagian gambar adalah untuk membantu manusia mengenali sesuatu gambar yang tidak dikenali dengan lebih senang. Berdasarkan projek ini, pembahagian gambar yang dikeluarkan untuk membuat analisis berdasarkan *region-based* dan *watershed transform* teknik. Teknik-teknik ini dibuat analisis yang lebih mendalam untuk mengenal pasti teknik yang terbaik digunakan dalam pembahagian gambar. Pada penghujung projek ini, perbandingan kebaikan dan keburukan antara *region-based* dan *watershed transform* teknik akan dijalankan. Oleh itu, teknik pembahagian gambar yang terbaik boleh dikenal pasti dan digunakan untuk pelbagai tujuan.

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LIST OF ABBREVIATIONS

ALPHABET	WORD	EXPLANATION
A	ANN	Artificial Neural Network
C	CNN	Cellular Neural Network
F	FL	Fuzzy Logic
G	GA	Genetic Algorithm
R	RP	Research Problem
R	RQ	Research Question
R	RO	Research Objective

CHAPTER I

INTRODUCTION

Image processing is computer imaging where application involves a human being in the visual loop. In other words the image are to be examined and a acted upon by people (Khalaf and Sagheer 2008). The main topics within the field of image processing include image segmentation, image classification and image compression. In this project will only cover on image segmentation. Image segmentation is an essential step in the image processing. Image segmentation is a process in which regions or features sharing similar characteristics are identified and grouped together. The purpose of image segmentation is to simplify change the representation of an image into something that is more meaningful and easier to analyze. Several techniques have been developed for image segmentation. This project is to compare the two basic image segmentation techniques, there are region-based and watershed transform.

1.1 Project Background

Image processing plays an important role in the development of technologies for dealing with security issues. It is divided into a few categories such as segmentation and classification. However, this project is covered only the image segmentation. Segmentation is one of the steps in image processing. It refers to the process of partitioning a digital image into multiple regions (sets of pixels)(Amol C

and Pravin L 2007). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture(Singh and Singh 2010).

Nowadays, image segmentation has become an important technology for image processing. The applications of segmentation range from filtering of noisy images, location of tumours and other pathologies, measure tissue volumes, computer-guided surgery and diagnosis of anatomical structure medical imaging, locate objects in satellite images (roads, forests etc.), face recognition, iris recognition, fingerprint recognition, traffic control systems, brake light detection, machine vision, crop disease detection in agricultural images etc(Saritha 2013).

There are many techniques under the image segmentation. These techniques include thresholding, edge-detection, clustering, histogram-based, region-based, and watershed transform. This project will only focus on two of the segmentation techniques; there are region-based and watershed transform.

On the one hand, the comparison between region-based and watershed techniques will carry out in this project in order to identify the best technique to use in image segmentation.

1.2 Problem Statements

Image is essential in many workplaces especially in the field of security. Sometime we are hardly to recognize the elements or objects inside the image that we needed and lead to annoy to be happened. In order to make the unclear image easy to be recognized, the method of image segmentation is applied. However, there are lots of techniques under image segmentation that can be used. We do not understand more about the benefits of each of the image segmentation techniques. Therefore, we are getting confuse about which technique is the most suitable. The Research Problem (RP) is summarized into Table 1.1.

Table 1.1 Summary of Research Problem

No	Research Problems
RP 1	Lack of image understanding and recognition of an object in the image.
RP 2	Lack of understanding about the benefits for each of the techniques.
RP 3	Too many techniques can be applied to image segmentation.

1.3 Research Questions

Three RQ are constructed to identify the research problem as discussed in previous section. These RQ is the guides to formulate the RO of this project.

RQ 1: How to distinguish or recognize the objects in an image?

This research question is formulated by considering the image understanding and recognition of an object in the image.

RQ 2: What are the advantages and disadvantages for each of the segmentation techniques?

This research question is formulated by considering the understanding about the benefits and drawbacks for each of the techniques selected.

RQ 3: Which segmentation techniques can produce the best result in image segmentation?

This research question is formulated by considering the best techniques that can be applied to image segmentation.

The research questions were summarized as shown in Table 1.2.

Table 1.2 Summary of Research Question

RP	RQ	Research Questions
RP 1	RQ 1	How to distinguish or recognize the objects in an image?
RP 2	RQ 2	What are the advantages and disadvantages for each of the segmentation techniques?
RP 3	RQ 3	Which segmentation techniques can produce the best result in image segmentation?

1.4 Objective

Based on the research questions formulated in previous section, appropriate RO are developed as follows:

RO 1: To analyse the region-based and watershed transform techniques.

In order to distinguish or recognize the objects in an image, first need to identify the image segmentation techniques and analyse the selected techniques.

RO 2: To compare the advantages and disadvantages of region-based and watershed transform techniques.

Based on the analysis and results of the techniques, the comparison of the techniques will be carrying out.

RO 3: To identify the best technique to be used in image segmentation.

The best techniques to use in image segmentation can be defined from the comparison that had done in previous.

The research objectives were summarized as shown in Table 1.3.

Table 1.3 Summary of Research Objective

RP	RQ	RO	Research Objectives
RP 1	RQ 1	RO 1	To analyse the region-based and watershed transform techniques.
RP 2	RQ 2	RO 2	To compare the advantages and disadvantages of region-based and watershed transform techniques.
RP 3	RQ 3	RO 3	To identify the best technique to be used in image segmentation.

1.5 Scopes

The Scope of this project is going to be conducted by using the image from Malaysia Remote Sensing Agency which taken from Quick Bird Satellite Image for June 2010 of Kuala Linggi Mangroves Forest, Alor Gajar Melaka with size of 277 x 225 pixels on 256 bits or uint 8. Besides, the segmentation techniques used were focusing only on region-based and watershed transform techniques in order to identify the best techniques which produce the better output. The software used to do the segmentation was Matlab R2009a.

1.6 Project Significant

This study will be a significant endeavor in recognizing pattern of an image. This study will also beneficial to professionals in many workplaces for security issues. By understanding the advantages and disadvantages of each of the image segmentation techniques, the best technique will be defined.

1.7 Expected Result

At the end of this project, the results must achieve the goals of this project such as:

- i. The objects in an image can be distinguished or recognized easily.
- ii. The best image segmentation technique is identified.
- iii. The advantages and disadvantages for each of the segmentation techniques should be discovered after the carry out the comparison.

1.8 Conclusion

In conclusion, this project will identify the techniques used for the image segmentation and analyse the region-based and watershed transform techniques. Besides, the suitable or the best technique for image segmentation will be defined. The operations of the techniques will be controlled by using the MatlabR2009a software. Furthermore, the problem statement, research questions, research objectives, project scope, project significant and expected result were clearly stated in this chapter. In the next chapter will cover on the literature review and project methodology.

CHAPTER II

LITERATURE LEVIEW

2.1 Introduction

Image segmentation is very essential image analysis task in image engineering and computer vision. The pixels identified in an image of segments share a homogeneous spectral similarity within a segment. The goal of segmentation is to change the representation of an image into more simple form that is easier to process and analyze. Image segmentation is normally used to locate objects especially in satellite image by applying segmentation algorithm.

Image segmentation algorithms are classified into several types according to the segmentation techniques such as thresholding, edge-detection, region-based and watershed transform. These techniques have their own advantages and disadvantages in terms of performances and basically the techniques were used based on the suitability to the problems.

Segmentation algorithm is divided into two categories. In the first category, the approach is to partition an image based on abrupt changes in intensity values which called discontinuity. The other category, the approach is to partition an image into regions that are similar according to some predefined criteria(Zhongliang, Ling et al. 2008). When dealing with the satellite imagery, the image can be divided into various landscapes according to the object to be segmented. The table 2.1 shows the classification of the segmented objects.

Table 2.1 Classification of objects to be segmented (TALREJA, UDHWANI et al. 2010)

No.	Landscape	Segmentation required
1.	Urban Landscape	Roads, Buildings, Gardens, Lakes, Rivers
2.	Rural Landscape	Farms of different crops and patterns Human establishments Roads, Rivers, Canals
3.	Uninhabited Landscape	Forests of different kinds, Oasis in a desert, Roads, Rivers, Lakes, Swamps, Glaciers
4.	Sea and Oceans	Oil spills, Broken ice shelves or icebergs, Large masses of floating algae, Individual vessels, floating in the ocean, Ocean currents if possible.

In this research, the two techniques to be selected for segmenting the image were region-based and watershed transform. The organization of image processing can be broadly classified as the Figure 2.1 shown below.

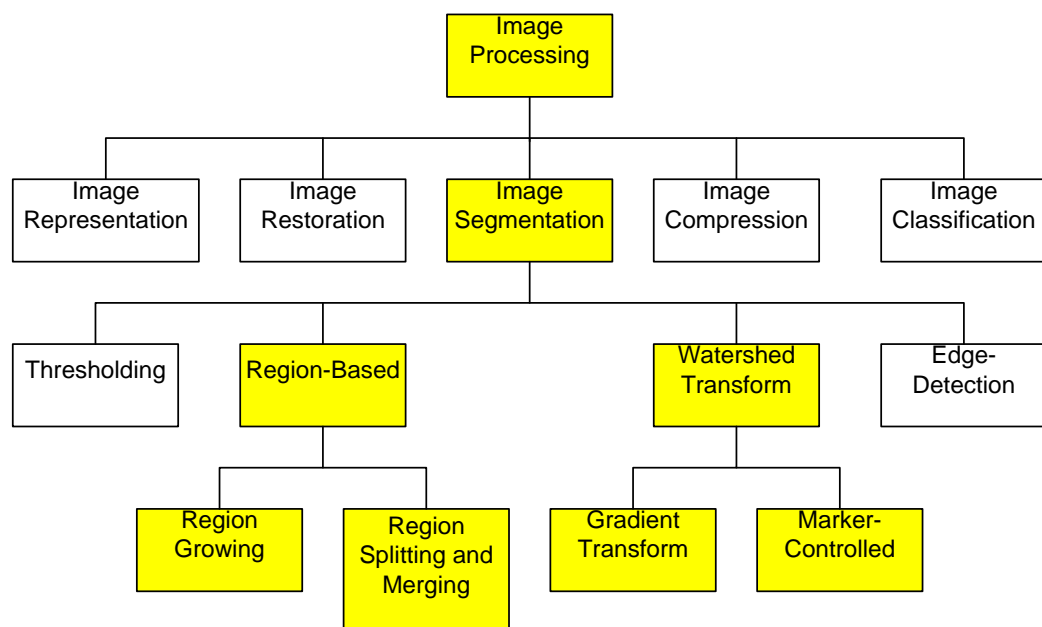


Figure 2.1 Organization of image processing