

UNIVERSITI TEKNOLOGI MARA

**IMAGE SEGMENTATION OF REPETITIVE
PATTERNS**

KAMELIA BINTI KAMEL

**Dissertation submitted in partial fulfillment of the requirement
for the degree of
Master of Science (Computer Science)**

Faculty of Computer & Mathematical Sciences

July 2014

ABSTRACT

Image segmentation is a challenging task in the area of image processing and has been researched for the last four decades. There are many research conducted on image segmentation, but a special attention needs to be focused on segmentation of images with repetitive patterns, as it involves grouping the repeated patterns in a meaningful structure. The objectives of this study is to propose a method to segment the repetitive patterns image and grouped the images based on its shape features. For this purpose, 7 Pua Kumbu images is selected. There are several steps involved throughout the proposed method. The input image is divided into sub-windows before each of the sub-windows is segmented using Biased Normalized Cuts. All the objects from the segmented sub-window is extracted and separated from each other. Then, region-based shape feature extraction is employed for each of the objects. The result of object's feature extraction is compared with the feature extraction of the given template. The similarity measurement is calculated by using Euclidean Distance. Lastly, the accuracy of the final result is evaluated by using the Recall Precision approach. The experimental results show that as the number of cuts in segmentation process increases, it will give better result. The recall and precision evaluation gives the average of 76.29% and 61.71%, respectively.

Keywords: *Image Processing, Image Segmentation, Repetitive Patterns, Biased Normalized Cuts*

ACKNOWLEDGEMENTS

First of all, all praises and thanks to Allah, Lord Al-Mighty, for His guidance and will, for the revelation of some of His knowledge to me during the completion of this research dissertation.

This research dissertation would not be successful without the help and support from my supervisor, Assoc. Prof. Dr. Nursuriati Jamil. Lots of thanks and countless of appreciation for her advices, instructions, motivation, support and guidance throughout the completing this research dissertation.

Special thanks to beloved family for their full support, understanding and courage throughout the research dissertation.

Finally, a deepest gratitude to my colleagues of CS707 for sharing their knowledge and their invaluable help, assistance and advices. Thank you very much.

TABLE OF CONTENTS

	Page
Author's Declaration	iii
Abstract	iv
Acknowledgement	v
List of Tables	viii
List of Figures	ix
CHAPTER 1: INTRODUCTION	
1.1 Introduction	1
1.2 Problem Statement	2
1.3 Research Objectives	2
1.4 Research Scope	3
1.5 Significances of Research	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction	5
2.2 Pua Kumbu	5
2.3 Biased Normalized Cuts Segmentation Method	7
2.3.1 Algorithm	9
2.4 Shape Feature Extraction	11
2.4.1 Area	11
2.4.2 Eccentricity	12
2.4.3 Compactness	12
2.4.4 Rectangularity	13
2.4.5 Solidity	13
2.5 Related Works	14
CHAPTER 3: RESEARCH METHODOLOGY	
3.1 Introduction	18
3.2 Research Activities	18
3.3 Theoretical Study	19
3.4 Proposed Method	21

3.4.1	Step 1: Dividing Image into Sub-windows	23
3.4.2	Step 2: Segmentation of Each Sub-window	24
3.4.3	Step 3: Find and Grouped Repeated Objects	25
3.5	Prototype Development	27
3.5.1	Step 1: Dividing Image into Sub-windows	27
3.5.2	Step 2: Segmentation of Each Sub-window	27
3.5.3	Step 3: Find and Grouped Repeated Objects	28
3.6	Prototype Evaluation	29
3.7	Summary	29
CHAPTER 4:	RESULTS	
4.1	Introduction	30
4.2	Step 1: Dividing Image into Sub-windows	30
4.3	Step 2: Segmentation of Each Sub-window	32
4.4	Step 3: Find and Grouped Repeated Objects	36
4.5	Segmentation Evaluation Results	50
CHAPTER 5:	CONCLUSION AND RECOMMENDATIONS	
5.1	Conclusion	54
5.2	Recommendations	55
REFERENCES		56
APPENDICES		59
Appendix A:	List of template images and its shape feature descriptors.	60
Appendix B:	Final Segmentation Result	62