



1.0 Introduction

- Image segmentation
 - Decompose an image into meaningful segments that correlates with the real world.
- Segmentation methods
 - Edge detectors - opened contours
 - Graph partitioning – normalised cuts



1.0 Introduction

- Image resizing before image segmentation
 - Present digital cameras produce high resolution image
 - Suitable resolution at which the algorithm can perform image segmentation with minimal burden.
- Image resizing issue
 - Natural images are likely to be restricted for resizing them into a particular smaller resolution.



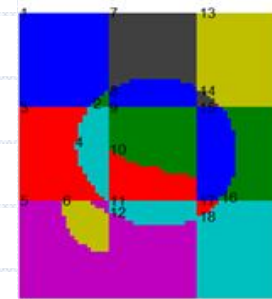
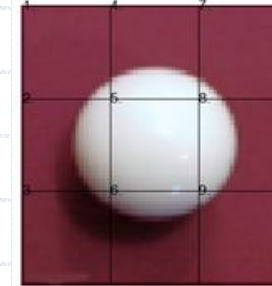
2.0 Objective

- The purpose of this paper is to present an alternative approach to perform normalised cuts based segmentation.
- Normalised cuts algorithm requires massive similarity measurement computation for image segmentation.
 - To avoid processing such large data, it is suggested that a high resolution image be divided into equal size image cells.



3.0 Methodology

- Dividing image into image cells
 - Construct $M \times N = n$ image cells
- First stage segmentation
 - Local segmentation into k_1 clusters
- Nodes computation
 - Each of the segmented clusters is represented as a node





3.0 Methodology

- Second stage segmentation
 - Based on the nodes, final segmentation is performed to segment out k_2 clusters.



Segmentation result

4.0 Experimental Results and Discussions



Input image (300 × 400)

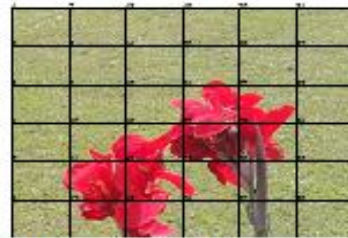
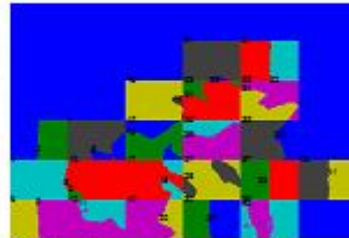


Image cells division



First stage segmentation

Segmentation result:



8.31 minutes

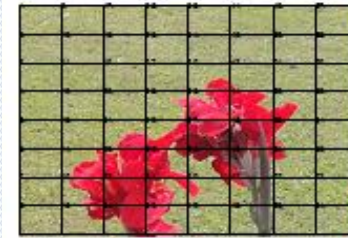
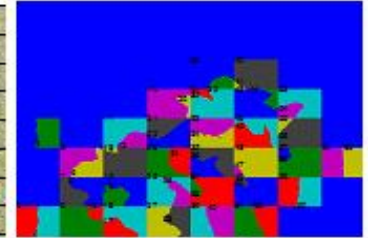


Image cells division



First stage segmentation

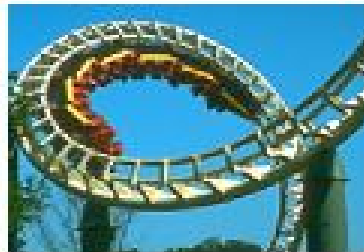
Segmentation result:



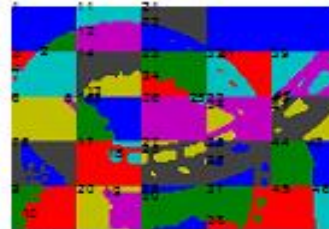
3.6 minutes

- Boundaries follows closely with the edge of the flower petal in the image.
- 8×8 image cells segmentation gives significantly less computation time than the 6×6 image cells segmentation.

4.0 Experimental Results and Discussions



Input image 120×160



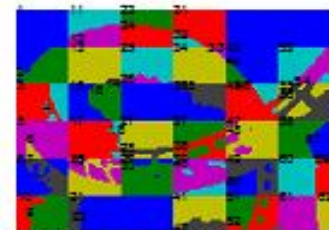
5x5 image cells



Cluster 1



Cluster 2



6x6 image cells



Cluster 1



Cluster 2

- Normalised cuts algorithm is able to tackle fine details of the objects in the image.
- Increasing number of cells may omit the cell that required segmentation in it and leads to having the final segmented clusters appeared blockish.



5.0 Conclusions

- With this approach, it enables normalised cuts algorithm to perform segmentation on image part by part individually instead of performing segmentation on whole image in one stage.
- This helps to speed up the normalised cuts algorithm.
- Improve the segmentation performance to be balanced up the trade-off between efficiency and effectiveness.
- For further improvement, adaptive image cells division can be implemented. The number of image cells to be divided into can be adaptively set according to the image content.