Grid-Based Genetic Algorithm Approach to Colour Image Segmentation

Image Segmentation is the process of identifying and extracting the distinct regions from an image.

A Grid is a system that:
1. coordinates resources that are not subject to centralised control
2. using standard, open, general-purpose protocols and interfaces
3. to deliver nontrivial qualities of service

Genetic Algorithms are an optimisation technique that work on large search spaces. They mimic natural selection, allowing a population to breed (via crossover and mutation) and evolve.

Grid-Based Genetic Algorithms

The major drawback of using a genetic algorithm with region merging is that it is very slow. Much research has gone into parallel genetic algorithms, while almost none for a Grid model. A Grid-based genetic algorithm model was developed which showed positive results solving simple problems on a Grid. Combining with segmentation still needs further work.

Genetic Algorithm for Image Segmentation

We used a genetic algorithm to modify the parameters of our region merging algorithm to improve the quality of segmentation.

Conclusion

The scope of this project was very large and there's still much research to be done in this area. Of the segmentation techniques we evaluated, the Watershed transformation shows the most promise being able to effectively segment an image in about two seconds. Genetic algorithms show promise of being able to improve segmentation quality. The results of running a genetic algorithm on a Grid were very positive. Further work needs to be done concerning running genetic algorithm based segmentation on a Grid.

Original Image  Region Growing
Region Merging  Watershed

Original Image  Using GA  Not Using GA

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