Efficient Graph-Based Image Segmentation

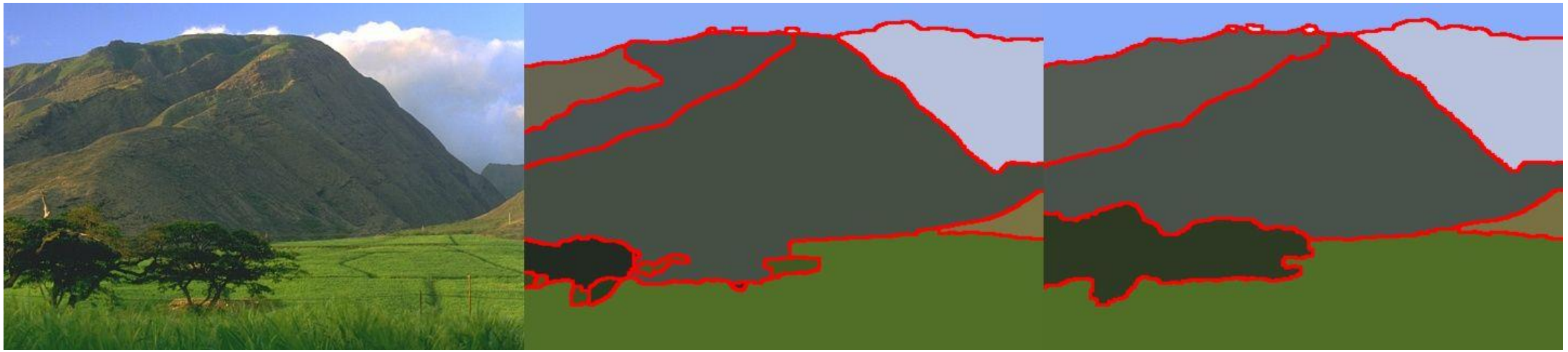
AUTHORS: P. F. FELZENSZWALB AND D. P. HUTTENLOCHER

PRESENT BY: AREF MOQADAM MEHR

What is Image Segmentation?

Partitioning pixels

Collectively cover entire image



Where can Segmentation be used?

Machine Vision

Object Detection

Medical Imaging

Content-based Image Retrieval

Related Works

Tresholding

Clustering

Histogram-Based methods

Edge Detection

Graph-Based methods

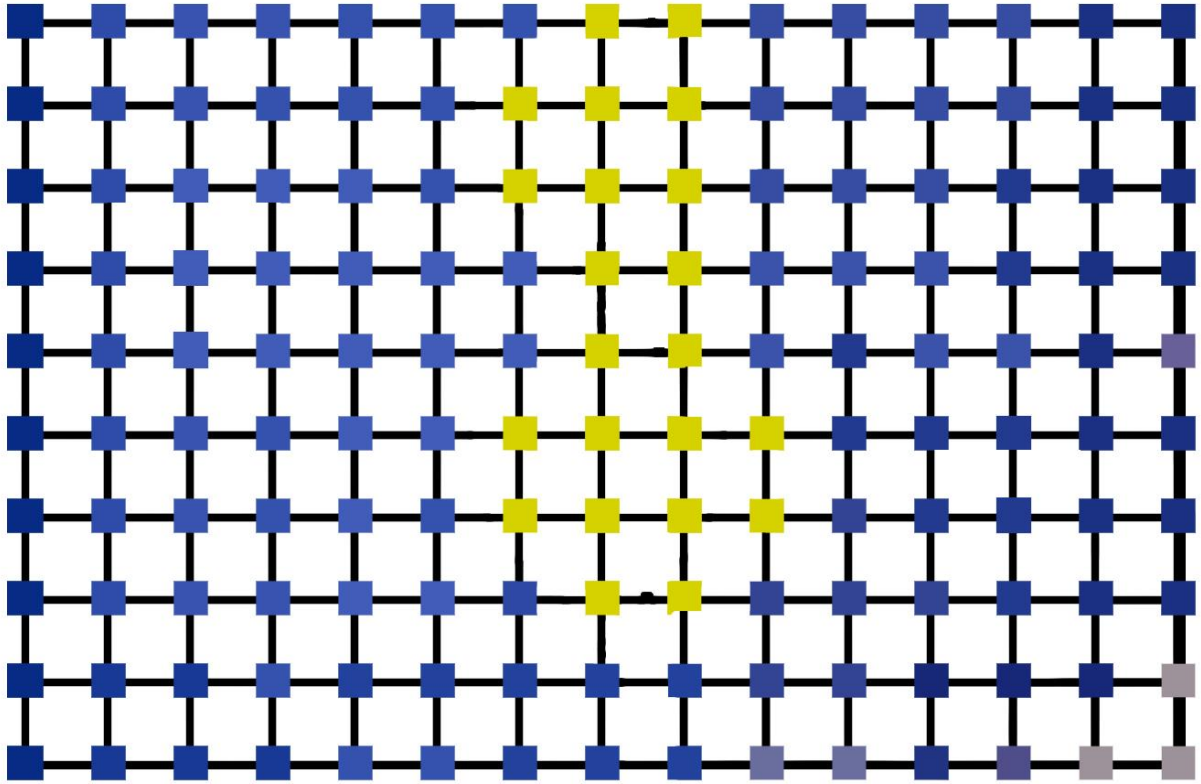
What is Image Graph?

Set of selected pixels

Sampling

Neighbor pixels

Non-negative weights



Previous Graph-Based methods

Early Graph-Based methods

Zahn Method (MST)

Graph-Cut

Normalized-Cut

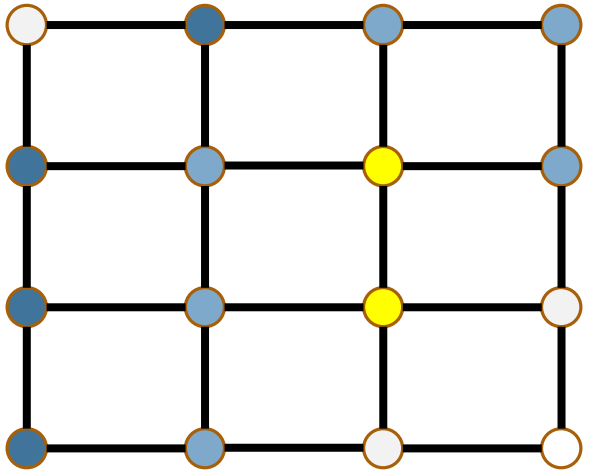
Region Merging

etc.

Efficient Graph-Base

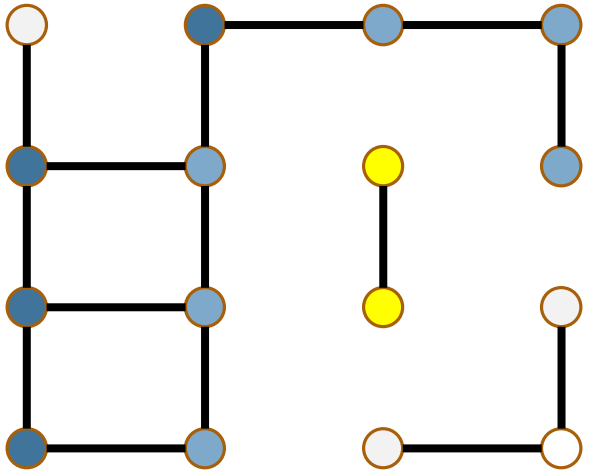
Algorithm

1. Create Graph
2. Sort
3. Merge
4. Extract Results



Algorithm

1. Create Graph
2. Sort
3. Merge
4. Extract Results



Internal Weight

$$Int(C) = \max_{e \in MST(C,E)} w(e)$$

$$D(e) = \begin{cases} true\ if\ w(e) < MInt(e) \\ false\ otherwise \end{cases}$$

$$MInt(e) = \min(Int(C_1) + \tau(C_1), Int(C_2) + \tau(C_2))$$

$$\tau(C) = \frac{k}{|C|}$$

Time Cost

1.	Create Graph	O(n)
2.	Sort	O(n log n)
3.	Merge	O(n)
4.	Extract Results	O(m)

n = number of pixels
m <= n

O(n log n)

Implementation Parameters

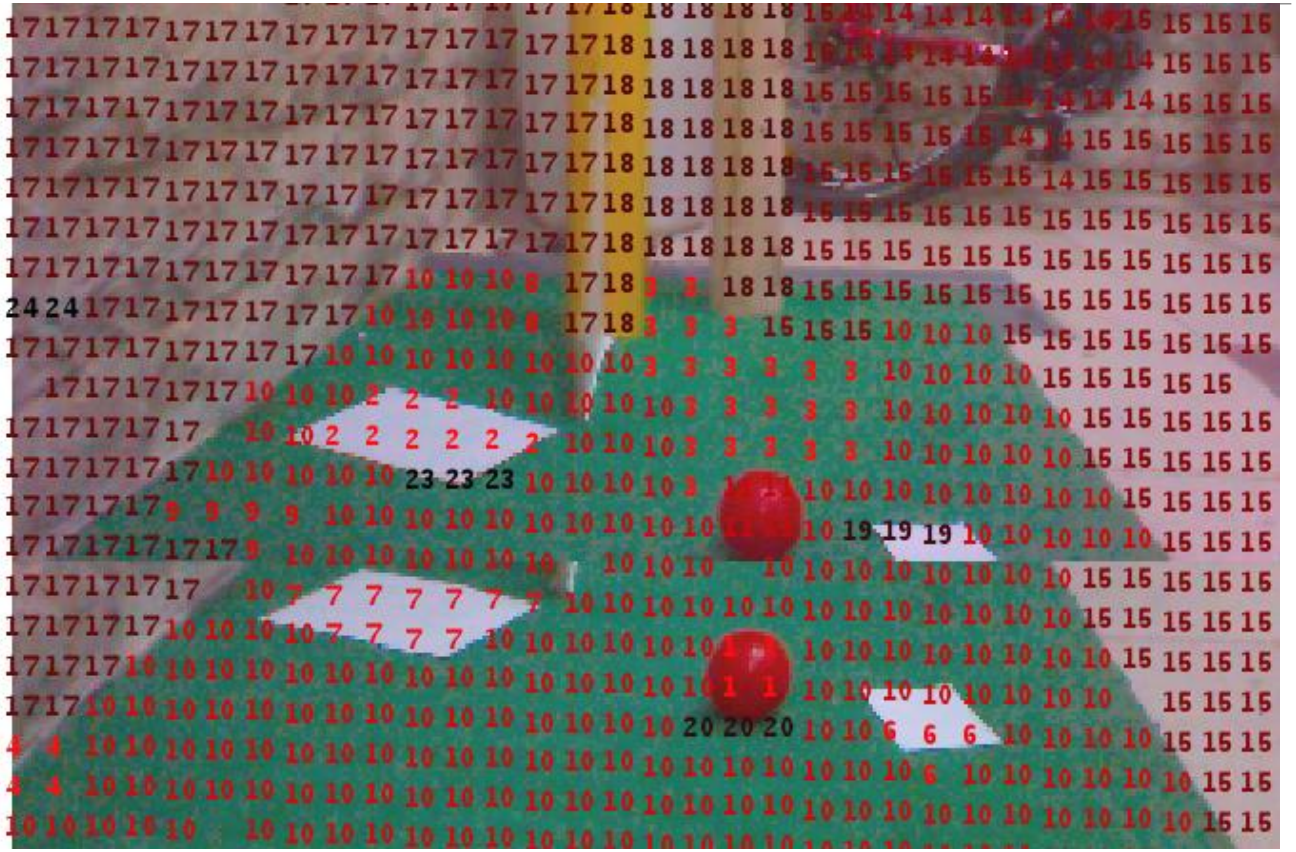
Image Preparation

Mesh Step

Sorting Method

Weight Calculation

K parameter



Conclusion

Time Efficiency

Performance

- Not too fine
- Not too coarse

Implementation

Scalability

Any Question?

Thanks for your patience!