RAMA UNIVERSITY

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FACULTY OF EGINEERING

Digital Image Processing
LECTURE-39

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OUTLINE

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- THE RGGROW ALGORITHM
- THE RGGROW STATISTICAL TEST
- DECISION AND UPDATE
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Region Growing

Region growing techniques start with one pixel of a potential region and try to grow it by adding adjacent pixels till the pixels being compared are too dissimilar.

The first pixel selected can be just the first unlabeled pixel in the image or a set of seed pixels can be chosen from the image.

Usually a statistical test is used to decide which pixels can be added to a region.

The RGGROW Algorithm

- Let R be the N pixel region so far and P be a neighboring pixel with gray tone y.
- Define the mean $\bar{X}$ and scatter S^2 (sample variance) by

$$\bar{X} = 1/N \sum_{(r,c) \in R} I(r, c)$$

$$S^2 = 1/N \sum_{(r,c) \in R} (I(r, c) - \bar{X})^2$$

The RGGROW Statistical Test

The T statistic is defined by

$$T = \frac{(N-1) * N}{(N+1)} (y - X) / S$$

It has a T distribution if all the pixels in R and the test pixel y are independent and identically distributed normal's (IID assumption) .

Decision and Update

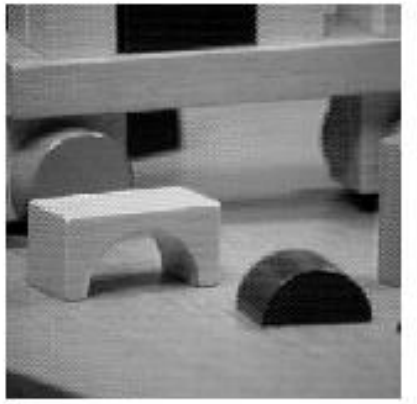
• For the T distribution, statistical tables give us the probability Pr(T <= t) for a given degrees of freedom and a confidence level. From this, pick suitable threshold t.

• If the computed T <= t for desired confidence level, add y to region R and update X and S .

• If T is too high, the value y is not likely to have arisen from the population of pixels in R. Start a new region.

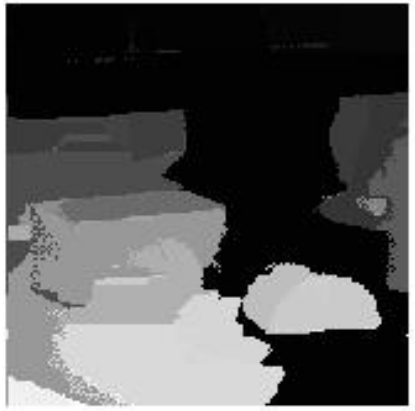
RGGROW Example

image



Not great!

segmentation



What do you think this would do on wallpaper texture?

Clustering

•There are K clusters C1,…, CK with means m1,…, mK.

• The least-squares error is defined as

$$D = \sum_{k=1}^{K} \sum_{xi \in Ck} \| xi - mk \|^2$$

• Out of all possible partitions into K clusters, choose the one that minimizes D.

MCQ

1. A spatial averaging filter in which all coefficients are equal is called _____.
   a) Square filter
   b) Neighborhood
   c) Box filter
   d) Zero filter
2. Which term is used to indicate that pixels are multiplied by different coefficients?
   a) Weighted average
   b) Squared average
   c) Spatial average
   d) None of the Mentioned
3. The non linear special filters whose response is based on ordering of the pixels contained is called _____.
   a) Box filter
   b) Square filter
   c) Gaussian filter
   d) Order-statistic filter

MCQ

4. Impulse noise in Order-statistic filter is also called as _____

a) Median noise

b) Bilinear noise

c) Salt and pepper noise

d) None of the Mentioned

5. Best example for a Order-statistic filter is _____

a) Impulse filter

b) Averaging filter

c) Median filter

d) None of the Mentioned

References

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