

### Question 1

- Explain the watershed transform. Propose a system which uses the watershed transform in the multiscale space (talk about the information we get for various sigma values)
- Explain K-means clustering
- Describe the opening and closing morphological operations

### Question 2

- Compute the second-order distortion of a scalar quantizer for a Laplacian distribution (the formulas of the distortion and of  $p(x)$  are given, explain the steps, the final answer is not that important)

### Question 3

- Prepare an overview of the Canny edge detector. Derive the SNR parameter. Comment the effect of scaling. Explain thresholding by hysteresis. Explain basic steps in the Canny edge detection algorithm.

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### Question 1

- Prove the rotation invariance of the laplacian. He also asks
- Wavelets: resolution and quality scalability, region of interest. a proof of the rotation of coordinates (real proof with trigonometry).
- Watershed transform: see above
- Question 2 and 3 also the same

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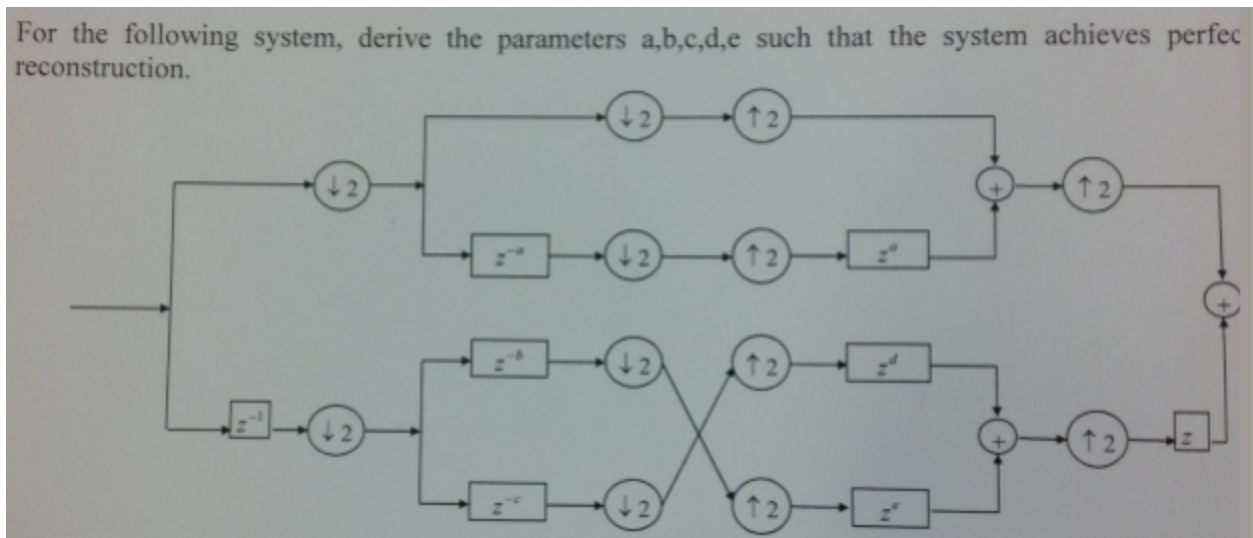
Q1: a. Localization properties of WT:

- Explain Time localization properties of WT
- Explain frequency localization properties of WT

b. Explain Distance transform and give example application of its usage

c. Explain SNN filtering

Q2:



Q3: Give overview of Canny Edge detection, SNR, LOC parameters, thresholding with hysteresis, how to choose thresholds, Main steps in Canny edge detection.

#### Question 1

- Explain uncertainty principle (extra questions about STFT and wavelets)
- Rotation invariant laplacian
- Explain distance transforms and cavity detector

#### Question 2

- Explain embedded deadzone quantization
- K-means clustering

#### Question 3

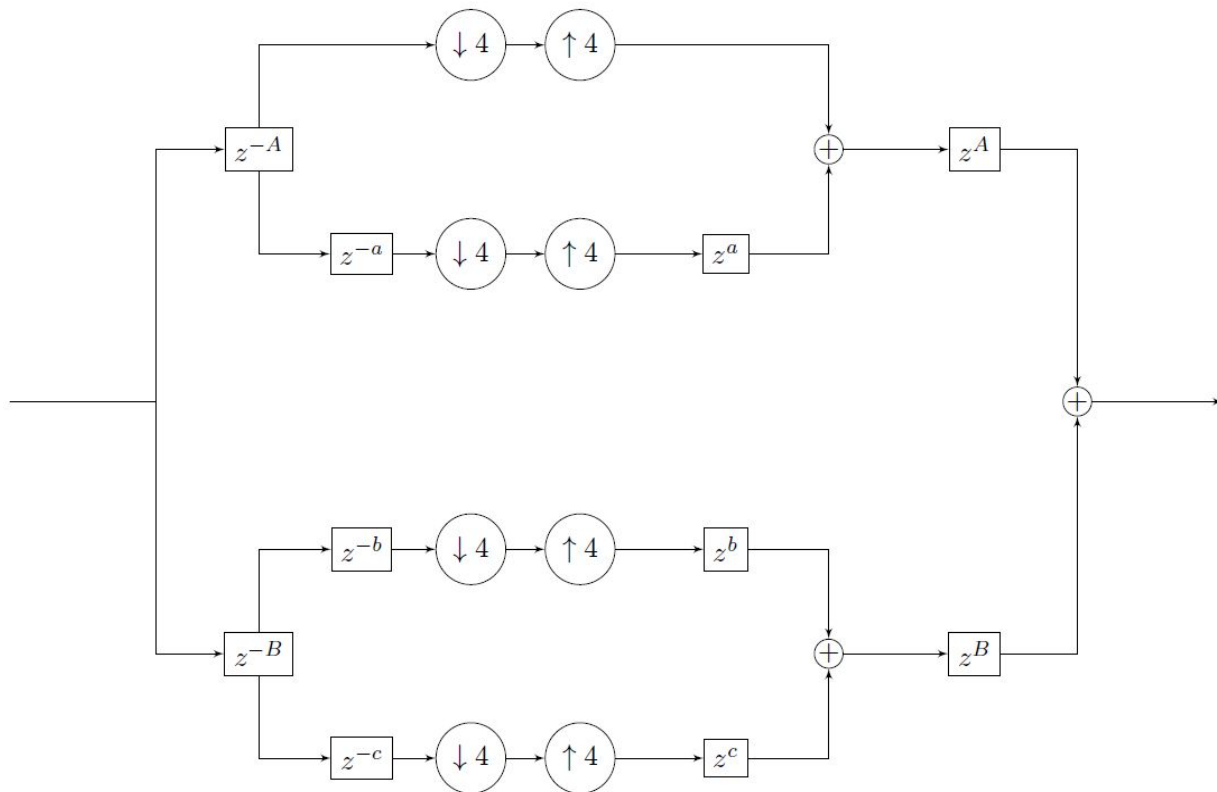
- Give an overview of KLT transform
- Canny edge of course. Derive the SNR. What edge detector is the best for SNR\*LOC?

### Question 1

1. Demonstrate the rotation invariance of the Laplacian
2. Propose a quality-scale method for compression using wavelet. How do you control the bit rate (compression level)? Is it possible to do resolution-scale? How? What about Region-Of-Interest?
3. Explain watershed. For what and how use it? Explain multi-scale use for segmentation, is that better than single-scale?

### Question 2

4. Find values of A,B, a, b, c to have perfect reconstruction.



### Question 3

5. Canny: Derive the SNR. What the SNR expresses? What's the impact of scaling on the SNR? And on the location of the edges? What is the impact of an increase of the SNR on the location? Which filter maximizes  $\text{SNR} \times \text{LOC}$ ?