Digital Image Processing

QUIZ 1 (sample questions)

Sample Questions: (expect 3-5 questions on the quiz)

- Describe in as much details as possible the idea of histogram stretching. How would you implement it? (Assume the range of initial histogram [a,b] and modified histogram [0,255].) Give short pseudo-code with all the formulas. What is main disadvantage of histogram stretching as compared to histogram equalization?
- Explain the concepts of variable thresholding. Give the exact formula. Give at least one advantage and one disadvantage as comparing to fixed thresholding. Explain what image conditions call for variable thresholding technique.
- Explain the concepts of (a) threshold-based and (b) directional edge-preserving smoothing. How would you select which to use? Can you combine both concepts?
- Explain **in details** the idea of Gaussian smoothing. Specify how window weights are computed. Would you implement such smoothing as 2D window or two 1D windows? Explain why. How one decides on window size while implementing Gaussian smoothing.
- Consider 12bit intensity data. How would you utilize the idea of histogram equalization to display such data using all three color channels (R,G,B) of the computer monitor (each displayed using 8 bits). Give enough details to implement such algorithm.
- Explain the idea of histogram specification. Explain how histogram equalization method (and look-up tables) can be utilized to implement histogram specification.
- Describe and compare RGB and HSI color representation schemes. What is the principal advantage of HSI representation? What is its main drawback? Consider applying histogram equalization to color images. Which representation you would choose: how and why? (Note: you do not need to provide HSI-RGB conversion formulas).
- Explain the idea of image histogram. How is it used to guide threshold selection when binarizing an image? How histogram shape would indicate if thresholding is likely to be good or subdivision of images into sub-regions is needed (for different thresholds for each sub-image)?

- When converting between color and grey level images consider (a) RGB to/from YIQ color conversion and (b) RGB to/from HSI color conversion. Explain why each is utilized and discuss advantages of each representation. (Note: you do not need to provide exact formula, just discuss approximate computation required).
- Describe **in detail** the iterative (optimal) threshold selection algorithm. Explain all the steps including initialization and stopping criterion. (Hint: this is the method utilizing background and foreground means).