

UNIVERSITY OF CALGARY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
SCHULICH SCHOOL OF ENGINEERING

ENEL697 DIGITAL IMAGE PROCESSING
WINTER 2009 SESSION: TEST NO. 2
8 April 2009

Instructions:

1. This is a closed-book, closed-notes test.
2. The use of only a nonprogrammable calculator with no text storage facilities is permitted.
3. Answer all four questions.
4. Total marks = 20.
5. Time permitted = 90 minutes.

Question 1: Write the definition of the subtracting Laplacian operator as applicable to a digital image.

Explain the effects and applications of the operator in image processing. (3 marks)

Question 2: Explain how high-frequency emphasis filtering may be performed in the frequency domain. Give a step-by-step algorithm starting from a given digital image, including all the required transformations, and leading to the final result.

Explain the differences between high-pass filtering and high-frequency emphasis filtering.

Explain the effects and applications of high-frequency emphasis filtering. (6 marks)

Question 3: With mathematical expressions as required, explain the derivation of the Laplacian-of-Gaussian operator.

Explain how the operator may be modified to filter an image at multiple scales.

State the important properties and applications of the operator. (6 marks)

Question 4: Give a step-by-step algorithmic description of the split-and-merge method for image segmentation. (5 marks)
