

Math 155, Spring 2004, Vese

Homework # 1

Due on Tuesday April 11 (collected by the T.A. Ben Cook)

[1] The median, ξ , of a set of numbers is such that half the values in the set are below ξ and the other half are above it. For example, the median of the set of values $\{2, 3, 8, 20, 21, 25, 31\}$ is 20.

- (a) Recall the definition of a linear operator H .
- (b) Show that an operator that computes the median is nonlinear.

[2] Reducing the Number of Gray Levels in an Image

(a) Write a computer program capable of reducing the number of gray levels in an image from 256 to 2, in integer powers of 2. The desired number of gray levels needs to be a variable input to your program.

(b) Download Fig. 2.21(a) and duplicate the results shown in Fig. 2.21 of the book.

[3]

(a) Give a continuous function for implementing the contrast stretching transformation shown in Fig. 3.2(a). In addition to m , your function must include a parameter, E , for controlling the slope of the function as it transitions from low to high gray-level values. Your function should be normalized so that its minimum and maximum values are 0 and 1, respectively.

(b) Sketch (plot) a family of transformations function of E , for a fixed value $m = L/2$, where L is the number of gray levels in the image. Include the transformation that will output a binary image.