Exam II Review Sheet

1. Thresholding –
   1. Definition: Segmentation, single thresholding, double thresholding, adaptive thresholding (Please read the class notes about the motivation. The purpose of thresholding)
   2. Otsu Method – purpose and concepts (Please read the class note and understand the concept of Otsu method. Got to the Module activities on D2L and do the self-evaluation.)
2. Convolution –
   1. Find convolution for a discrete aperiodic signal with respect to a kernel (If you work on the convolution following the definition once, you will be fine.)
   2. Tabular Method (This is easy.)

### *Tabular Method*

There is an easier way to find the result: Tabular Method. Since it is hard to type this with Word, I will write notes on the board in class. Given x[n] = [1, 2, 3, 4], n: 0, 1, 2, 3

h[n] = [4, 4, 3, 2], n: 0, 1, 2, 3

Step 1: Draw a table

Step 2: Write X[n] on top horizontally

Step 3: Write h[n] vertically on the left side

Step 4: Multiply the x[n] and h[n] and write down the result for each x[n] × h[n]

Step 5: Draw slanted dotted lines as shown above

Step 6: Add the individual sum as y[n]

Y[n] = [4, 12, 23, 36, 29, 18, 8]

Step 7: For X[n], n: 0 – 3; For h[n], n:0 -3. Add the smallest numbers of the two sequences 0 + 0 = 0;

Step 8: Add the largest numbers of the two sequences 3 + 3 = 6. The final results for y[n]:

=> y[n] = [4, 12, 23, 36, 29, 18, 8], n = 0, 1, 2, 3, 4, 5, 6.

* 1. Circular Convolution (This is easy.)

(Lecture Note#7 Example #2 Part 2)

* 1. Causes of Gaussian noise, or salt-and-pepper noise (What I meant is the kinds of salt-and-pepper noises. Salt is like white dots on a dark background. Pepper noises are black noises on a white background)

1. Types of Filters –
   1. Linear Filters- All filters that are able to represent as a convolution will be a linear operator. For example, Gaussian filters, average filters, are all linear filters.
   2. Non-Linear Filters – Maximum filters, minimum filters, medium filters are non-linear filters because they cannot be represented as a convolution.
   3. (Future) HPF vs LPF – Watch the video on D2L module.
2. Image Convolution – applying a kernel to an image
   1. Methods with various borders- Watch D2L module
   2. Sizes of Resulting images – Also on D2L
   3. Results – If you use 0-padding, you will add some extra artifacts like a dark frame on the edge of an image. For others, please read D2L.
3. DFT (Discrete Fourier Transformation)
   1. Concepts and definitions
   2. HW#2 – (Check Module #10, Textbook section 7.3, or lecture Note#7B Section 2.3)

Graphical user interface, text, application

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* 1. Diagram

     Description automatically generatedHW#2 - Find DFT: Find the DFT if f(x) = [ 0, 1, 2, 3]