EECE-5626 (IP&PR) : Homework-1

Due on Septembet 24, 2020 by 11:59 pm via submission portal.

NAME: Enter your Lastname, Firstname here

Instructions:

1. You are required to complete this assignment using Live Editor.
2. Enter your MATLAB script in the spaces provided. If it contains a plot, the plot will be displayed after the script.
3. All your plots must be properly labeled and should have appropriate titles to get full credit.
4. Use the equation editor to typeset mathematical material such as variables, equations, etc.
5. After completeing this assignment, export this Live script to PDF and submit the PDF file through the provided submission portal.
6. You will have two attempts to submit your assignment. However, make every effort to submit the correct and completed PDF file the first time. If you use the second attempt, then that submission will be graded.
7. Your submission of problem solutions must be in the given order, i.e., P1, P2, P3, etc. Do not submit in a random order.
8. Please submit your homework before the due date/time. A late submission after midnight of the due date will result in loss of points at a rate of 10% per hour until 8 am the following day, at which time the solutions will be published.

Reading Assignment: Chapters 1 and 2 from DIP4E and DSPUM3E.

Problem-1: DIP4E Problem 2.10

Solution:

Problem-2: DIP4E Problem 2.13

Solution:

(a)

(b)

Problem-3: DIP4E Problem 2.52

Solution:

(a)

(b)

(c)

Problem-4: DIP4E Project 2.10

Solution:

Problem-5: DIPUM3E Matlab Projects 2.3 and 2.6

Solution:

(a) MP 2.3:

(b) MP 2.6:

Problem-6: DIPUM3E Matlab Project 2.8

Solution:

Problem-7

Let $f(m,n)$ be an input image, $h(m,n)$ be an impulse response, and $g(m,n)$ be the corresponding output image obtained via the 2-D convolution. Prove the following volume conservation property:

$$\sum_{m,n=-\infty}^{\infty}\sum g(m,n) = \left[\sum_{m,n=-\infty}^{\infty}\sum h(m,n)\right]\left[\sum_{m,n=-\infty}^{\infty}\sum f(m,n)\right]$$

Proof:

Problem-8

Consider the following two-dimensional signal $f(m,n)$, where the bracketed element denotes the $(0,0)$ location

$$f(m,n) = \begin{matrix} 8 & 5 & 3 \\ 6 & 7 & 4 \\ 4 & [7] & 6 \\ 3 & 5 & 8 \\ & \downarrow_{m} & \end{matrix} \rightarrow n$$

(a) Determine the convolution of $f(m,n)$ with each of the following signals

i.
$$\begin{matrix} 0 & 1 & 0 \\ 1 & [-4] & 1 \\ 0 & 1 & 0 \end{matrix}$$

Solution :

ii.
$$\begin{matrix} 1 & 0 & 0 \\ 0 & [2] & 0 \\ 0 & 0 & 1 \end{matrix}$$

Solution :

iii.
$$\begin{matrix} & 0 & 2 \\ [-2] & 0 & \\ & 0 & 2 \end{matrix}$$

Solution :

(b) Verify your answers in each case via the ***volume conservation*** property proved in **Problem 7** above.

Solution :
