CSE585/EE555: Digital Image Processing II

Spring 2020

Written Homework #1

assigned: 13 January 2020
due: Friday 24 January in 1st Floor EE East Homework Slot*

reading assignment: Pitas and Venetsanopoulos (P&V: PitasCh6.pdf) Ch. 6.1-6.2;
First few pages of Maragos and Schafer paper (Maragos-Schafer.pdf)

***Clearly write Your NAME and course number on your homework!**

***Written homeworks must be deposited before 4PM to be officially stamped as turned in that day!**

1. As we saw in class, $A \bigcap B = \{z : \ z \in A \ \text{ and } \ z \in B\}$. Write the following expressions also in the form
   expression $= \{z : \ z \ \text{ satisfies property P}\}$

   (a) $A \bigcup B^c$

   (b) $B/(A \bigcap C)$

   (c) $A \oplus B$

2. Consider the morphological transformation $\Psi(X) = X \oplus B_z$, where $\vec{0} \notin B$ and $z \neq \vec{0}$. Determine if $\Psi(X)$ is increasing, extensive, idempotent, and homotopic. If the property is true, you must prove it. If it is false, you must show it is false by giving a counterexample.

3. For the same transformation as above, show the first three principles of mathematical morphology, as discussed by P&V in Sect. 6.1. Also, qualitatively discuss the fourth principle, semi-continuity — you can do this with a pictorial example.

4. Show that erosion is anti-extensive if the structuring element contains the origin. Give a counterexample to demonstrate that erosion is not necessarily anti-extensive if the structuring element does not contain the origin.