

COM-303 - Signal Processing for Communications

Solutions for Homework #11

Solution 1. 2D filtering

4, 5, 2, 3, 6, 1

(if in doubt, implement the filter in Python but remember that the axis convention in numerical packages for image processing may be flipped with respect to the textbook (i.e., the origin $[0,0]$ may be the upper left corner of the image))

Solution 2. bilinear interpolation

(f).

Solution 3. Noise reduction

Salt and pepper noise is modeled by random *isolated* pixels with a radically wrong value. To eliminate the noise we can try to replace each pixel by an average of the surrounding pixels, so that filters (a) and (c) may work.

In reality, salt and pepper noise is best eliminated by nonlinear processing method such as median filtering.

Solution 4. Edge detection

(a), (b), (c).

Solution 5. Image filtering

5, 4, 6, 3, 1, 2.

Solution 6. Prefix-free code

$(a), (b), (c)$.

Solution 7. Huffman coding

$(a), (b), (c)$.

Solution 8. zigzag scan

$(0, 80), (1, -10), (3, 2), (0, 1), (1, -2), (10, 1), (0, 0)$.

Solution 9. Compression schemes

(c) .
