ECE 515 Homework 2 (20 points)

Due February 22

1. (4 points)

   Consider the filter $K = \frac{1}{18}\begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix}$.

   a. Is the filter separable? Why?
   b. What are the corresponding horizontal and vertical component filters?

2. (8 points)
   a. Select any picture and display it.
   b. Convert the picture to gray scale and display it.
   c. Divide the picture in 8x8 blocks.
      For each block:
      i. Calculate the DCT
      ii. Preserve the top R=4 rows and set the bottom remaining rows equal to all zeros.
      iii. Calculate the IDCT
   d. Display the image and comment on the results.
   e. Repeat points c. and d. above, with R=2 and R=1.

3. (8 points)
   a. Selects two square 2Cx2C pictures P1 and P2 and display them.
   b. Generate an alpha image in the following way:
      All pixels with a distance from the center of the image equal to less than C/2 are equal to 1.
      All pixels with a distance from the center of the image equal to more than C are equal to 0.
      All pixels in between have a decreasing value from 1 to 0 as the distance from the center of the image increases.
      Plot the alpha image.
   c. Use P1, P2 and the alpha image to show the effect of compositing and matting.