**Computer Vision, Homework 02:**   
  
The deadline is on MyCourses. See MyCourses for the assignment date.  
  
**If you just joined the course, Get a Matlab the RIT installation page:**

When I run Matlab, I need to run the RIT VPN so that my license works. You might not need to also.  
  
<http://www.rit.edu/its/services/personal-computers/software>

Download and install Matlab.  
  
Install all possible toolboxes you are offered (sub-components of Matlab).  
  
  
**HOW TO MAKE A SUBMISSION:**

1. Create a directory named HW\_02\_<YourFirstName>\_<YourLastName>\_DIR.  
     
   Notice that there are not spaces or whitespace in the directory name.   
     
   Use this exact naming convention. We run a script on our end that expects this.  
     
   When you turn in your homework, you will turn in this entire directory in one zip file.   
   The zip file must unzip to create the directory. I do not want to hunt around, sort, and re-name a hundred files.  
     
   If your submission unzips to a set of individual files in the current directory, those files will be deleted on our end, and you get a zero for the homework.   
     
   It is good practice zip up your homework, then unzip it in a temporary directory, and be sure it creates a directory that is populated. Verify that it works.
2. (1 pts) In that directory, create a word document named HW\_02\_<YourFirstName>\_<LastName>.docx  
   Make the obvious substitutions.   
     
   Again, we use a script to process your homework assignments.  
     
   Again, have no spaces in the filename.  
     
   In your homework document, at the top put your FirstName, and LastName.  
   I get to know students by first name only, but even in a small class, we sometimes have two students named Akshay, Adam, Emilee, Emma, or Juan, or Mathew or (omg) Thomas! ☺  
     
   Be sure to use your first and last names..  
     
   Submit a PDF of this work, AND YOUR FUNCTIONING CODE.  
   The grader may look at either one of these.

(continued…)

**Assignment:**

1. (1) In Matlab, run the command “ver”.  
   This returns the version of matlab your are using, and your license number, and all of the Toolboxes you have installed.  
     
   Record your Matlab Version =   
   Record the Matlab license number =
2. (1) Image Inversion  
   write a file, in a function.   
     
   The file will be named image\_inversion.m.  
   Write the function with the same name.  
   Read in the cameraman:

im\_db = im2double( imread('cameraman.tif' ) );

Display the grayscale image, using imagesc, which scales the image for you:

imagesc( im\_db );

colormap( gray(256) );  
 axis image;  
  
Now display the negative of the image:  
 imagesc( 1 – im\_db ) ;   
 axis image;  
  
On your monitor, what happens to the details to the details in the image? Look at the jacket. Look at the sky.   
What edges and details of the image can you now see better than you could when the image was normal?  
  
Write your answer in your submission writeup.

1. (1) Histogram Understanding:  
   You are provided with a file named,   
   Gen\_Fig\_Showing\_Image\_to\_Histogram\_FOR\_STUDENT\_RELEASE.m  
   Run the program, make sure it runs.  
     
   You may need to change ‘capture\_graph( )’ to save\_curr\_fig\_to\_file( ‘my\_figure\_name’ );  
     
   Re-write the function so that it only has one for loop in it, instead of two.  
     
   Submit your modified code.  
     
   Use the save\_curr\_fig\_to\_file( ‘my\_part3\_results.png’ ) to save your figure.  
     
   Submit your results in your writeup:  
   IMPORT THE RESULTING FIGURE into your writeup.   
     
   Answer the question in your write-up:  
   What does this tell you about histograms?
2. (1) You are provided with a file named IMG\_2742\_Virginia\_Creeper.jpg.  
   Take a sub-sampled version of the green channel as gray:  
   im\_gray = im2double( im( 2:2:end, 2:2:end, 2) );  
   Find a binary segmentation that will cause the plant to appear white, while the background colors appear black.  
     
   Answer the question:  
   Did graythresh() give the best answer?  
   What did you do that worked?
3. (1) You are provided with a file:  
   IMG\_2548\_\_Needs\_Contrast\_Enhancement.jpg  
     
   Take a sub-sampled version of the green channel as gray:  
   im\_gray = im2double( im( 2:2:end, 2:2:end, 2) );  
   Using a method for contrast enhancement, such as histogram equalization or adaptive histogram equalization, find a way to display the grayscale version so that you can read the sign hidden in the shadows AND the sign that is visible.  
     
   In your write-up, describe what you did.  
   Show a small image of your results.
4. (1) You are provided with the file:  
   IMG\_2653\_IVY\_Against\_Wild\_Grape\_Vines.jpg

Find a way to make the IVY white, and the grape leaves black.  
  
In your write-up, describe what you did.  
Show a small image of your results.

1. (2) You are provided with the file: IMG\_2663\_DEER\_with\_Ears\_small.jpg.  
   We want to find a way to make the deer stand out against the background.  
     
   im\_db = im2double( imread( filename ) );  
   1. Try the red channel.  
      imagesc( im\_db(:,:,1) );  
      colormap(gray(256));  
      axis image;
   2. Try the green channel
   3. Try the blue channel
   4. Try the results of rgb2gray  
      im\_gray = rgb2gray( im\_db )
   5. Compute yellowness:  
      im\_yellow = ( im\_db(:,:,1) + im\_db(:,:,2) – 2 \* im\_db(:,:,3 ) / 2;
   6. Try this computation:  
      im\_whatever = ( im\_db(:,:,1) + im\_db(:,:,3) – 2 \* im\_db(:,:,2 ) / 2;
   7. Try this computation:  
      im\_whatever = ( im\_db(:,:,2) + im\_db(:,:,3) – 2 \* im\_db(:,:,1 ) / 2;

Which method worked worst?  
Show your image in your write up.

Which method was the best method?   
Show your resulting figure in your write up.

1. (2) Write a Conclusion:  
      
   Write two to three paragraphs about what you learned. What was challenging? What was easy? What surprised you? *Paragraphs are separated by a blank line.*