EE415 Digital Image Processing
Project 7
Filtering in the Frequency Domain

1. Lowpass Filter: Write a script `fig04_49.m` that reproduces the result shown in Figure 4.49. Your script should call a function that returns a GLPF of size $P \times Q$. Your function should accept as arguments $P$, $Q$, and $D_0$.

2. Highpass/Homomorphic Filter: Write a script `fig04_62.m` that reproduces the result in Figure 4.62. Your script should call a function that returns the homomorphic filter defined by Equation 4.9-29. Your function should accept as arguments $P$, $Q$, $\gamma_L$, $\gamma_H$, $c$, and $D_0$ and return the 2D matrix of size $P \times Q$ that defines the filter function $H$. Note: I was not able to reproduce the figure using the parameter values given in the text. Try to find values for the filter parameters that best reproduces the textbook results.

3. Notch Filter: Write a script `fig04_64.m` that reproduces the results in Figure 4.64 (all four figures). Your script should call a function that returns a Butterworth notch filter of size $P \times Q$ as defined in Equations 4.10-2 through 4.10-5. (Note: Eq 4.10-5 assumes three notch pairs, four notch pairs are used in producing Fig. 4.64.) Your filter should accept as arguments $P$, $Q$, $n$ (the filter order), $D_0$ (the filter radius parameter), $u_0$, and $v_0$ (the notch filter center coordinates). (A filter with notch center coordinates $u_0$, $v_0$ should also have another notch centered at $-u_0$, $-v_0$ for symmetry.) To reproduce Figure 4.64 you will need to call your filter function four times. Although values for $n$ and $D_0$ are given, you will need to determine the best values to use for the four $u_0$, $v_0$ pairs by trial and error. Also, I don't think the provided $D_0$ value is actually correct. Find the value that gives the best results.

All scripts should write images out as PNG files as in previous project assignments. Turn in a printed copy of your script. Email the script (as an attachment) to richardson.tony@gmail.com. The email subject must contain “EE415 Project 7” and then your name.