UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
Department of Electrical and Computer Engineering

ECE 498MH Signal and Image Analysis

Homework 7

Fall 2013

Assigned: Friday, November 1, 2013 Due: Friday, November 8, 2013

Reading: SPF Chapter 12-3 covers almost this material, but for continous↔discrete rather than discrete↔discrete

Problem 7.1

Consider the signal $x[n] = \cos(0.9\pi n)$.

(a) $y[n] = \cos(0.2\pi n)$ and $y[n] = \cos(-0.2\pi n)$ are both correct.

(b) (1)

$$z[n] = \begin{cases} \cos(0.1\pi n) & n \text{ even} \\ 0 & n \text{ odd} \end{cases}$$

(2)

$$z[n] = \frac{1}{2}\cos(0.1\pi n) + \frac{1}{2}\cos(0.9\pi n) \quad \text{for all } n$$

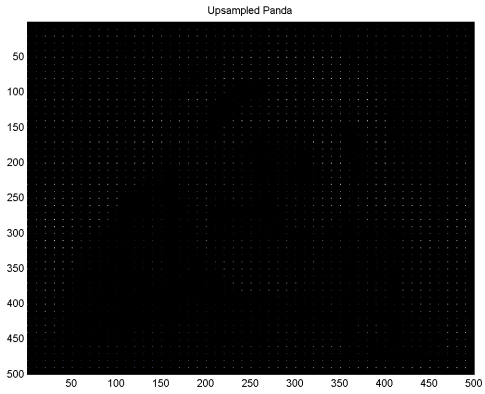
(c) $h[n] = \text{sinc}(\omega_c n)$ for any $0.1\pi < \omega_c < 0.9\pi$ will work.

Matlab Exercises

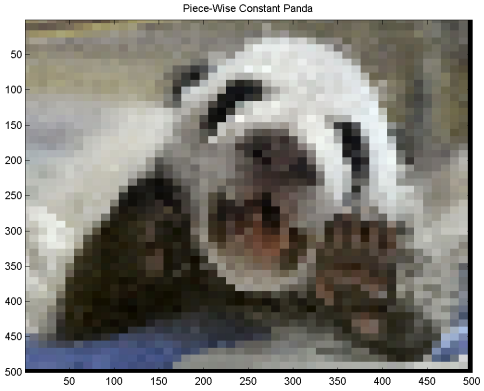
Problem 7.2

Original image:

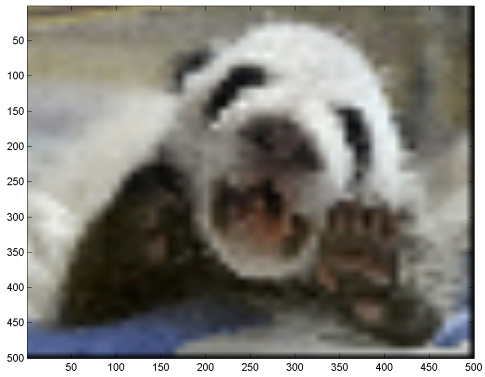
Upsampled image:



Piece-wise constant interpolation:



Piece-wise linear interpolation:



Hamming-windowed sinc interpolation:

Interpolated rows: