CISC4/642 Program Assignment-1
Due October 28, 2016 (5pm)

- **Part 1 (50 points)**

  This part of the assignment involves implementing various functionalities that were discussed in class with regards to the Gaussian and Laplacian pyramids. The original paper is available in Sakai along with this HW posting.

  - Write a function `Convolve(I,H)`. I is image of varying size, H is kernel of varying size. Output of function should be the convolution result that is displayed.
  - Write a function `Reduce(I)` that takes image I as input and outputs copy of image re-sampled by half the width and height of the input. Remember to Gaussian filter the image befure reducing it; use separable 1D Gaussian kernels.
  - Write a function `Expand(I)` that takes image I as input and outputs copy of image expanded, twice the width and height of the input.
  - Use the `Reduce()` function to write `GaussianPyramid(I,n)` function, where n is the no. of levels.
  - Use the above functions to write `LaplacianPyramids(I,n)` that produces n level Laplacian pyramid of I.
  - Write the `Reconstruct(LI,n)` function which collapses the Laplacian pyramid LI of n levels to generate the original image. Report the error in reconstruction using image differencing.
  - Blend given number of images using functions above (note: you should be able to handle color images). Let the user pick blend boundaries of all images by mouse. Your program then creates a bit-mask with equal weights for all images and displays the blended image.

Part 2 (50 points)

This part of the assignment involves using the least squares estimation technique to estimate parameters of the model.

- Given two image I_1 and I_2, compute the affine transformation parameters that would warp I_2 to I_1 using least squares estimation along the lines of the discussion in class. (The two transformed images would be provided to you).
- Use `ginput (or cpselect)` to extract 3 points from the two images manually and compute the transformation parameters.
- Extract more than 3 points and compute the transformation parameters from an over-constrained set of equations.
- Display the affine parameters as estimated by the two options stated above.
- Apply the functions developed in section 1 to seamlessly mosaic the images after having performed the affine "unwarping"

Extra Credit

The extra credit analyses the use of corner detectors to compute correspondences between images and the possibility of automatic creation of image mosaics. There would be 25 points for a completely automatic solution and 15 points for a semi-automatic solution.

- Apply the Harris corner detector (matlab code is made available) to compute correspondence between the feature (corner) points of two images
- Compute the transformation parameters using the correspondences and mosaic the images.